

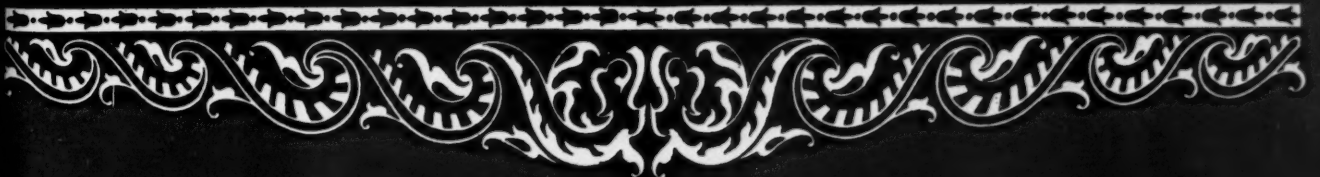
AUGUST, 1929

# Railway Engineering and Maintenance



Over 80% of the cleaning charge for this car was  
operated by one man. Use our cleaning wash  
for more good. For roof cleaning, give  
slippery roofs a good cleaning. For  
cleaning the side of the car, use  
the National Cleaning Company.

THE NATIONAL CLEANING COMPANY





# Uniformity



**N**O products made of hardened steel receive greater care during the heat treating operations than HY-CROME Spring Washers.

Every furnace is equipped with electric heat control units . . . the latest and most accurate pyrometer manufactured.

These instruments safeguard the great physical strength of HY-CROME and insure consistent uniformity.

It's one of the major reasons why HY-CROME protection costs less than the service rendered by ordinary spring washers.

**The Reliance Manufacturing Company**  
Massillon, Ohio  
Address Dept. M.E.

# HY-CROME

*"The Most of the Best for the Least"*

RAILWAY ENGINEERING AND MAINTENANCE

Published monthly by Simmons-Boardman Publishing Co., at 165 W. Adams St., Chicago. Subscription price: United States, Canada and Mexico, \$2.00; foreign countries, \$3.00 a year. Single copy, 35 cents. Entered as second class matter January 13, 1916, at the postoffice at Chicago, Illinois, under the Act of March 3, 1879. Alphabetical Index to Advertisers, Page 64

Classified Index to Advertisers, 60-62



## PERFECT SEATING

### *That Assures Correct Gauge*

**T**HIS cross section shows how uniformly the Lundie Plate seats itself on the tie.

The plate compresses without cutting a single fibre of the tie and develops a hardened glazed wear resisting surface.

The bottom of the tie plate provides a series of at least 10 rounded steps of resistance, giving tremendous holding power against plate movement and consequent spreading of track. All this is accomplished without sacrificing any tie life through the use of destructive cutting projections.

Now, when tie renewals are in full swing, is the time to pave the way for big future economies. Protect these ties with Lundie Tie Plates. They not only maintain correct gauge, cant the rail at the desired inclination, but protect the ties against mechanical destruction and prolong their life in track.

#### **The Lundie Engineering Corporation**

285 Madison Avenue, New York  
166 West Jackson Boulevard, Chicago

# LUNDIE

**TIE PLATE**

T H E R A I L R O A D




Performance  
on the Job  
Counts

## SUPERIORITY

What makes Fairmont Motor Cars superior?

They are more sturdily built—built to endure. There are many of the original Fairmont cars still performing faithfully every day—even after 18 years of steady wear—think of that!

Today, over half of all the motor cars in use are Fairmont Products. That is certainly demonstrated superiority.

**FAIRMONT RAILWAY MOTORS, INC.**

General Offices: FAIRMONT, MINNESOTA

General Sales Offices: CHICAGO, ILLINOIS  
New York City Washington, D. C. St. Louis San Francisco New Orleans  
Winnipeg, Canada Mexico City, Mexico

BALDWIN LOCOMOTIVE WORKS, Foreign Representative

W O R L D K N O W S

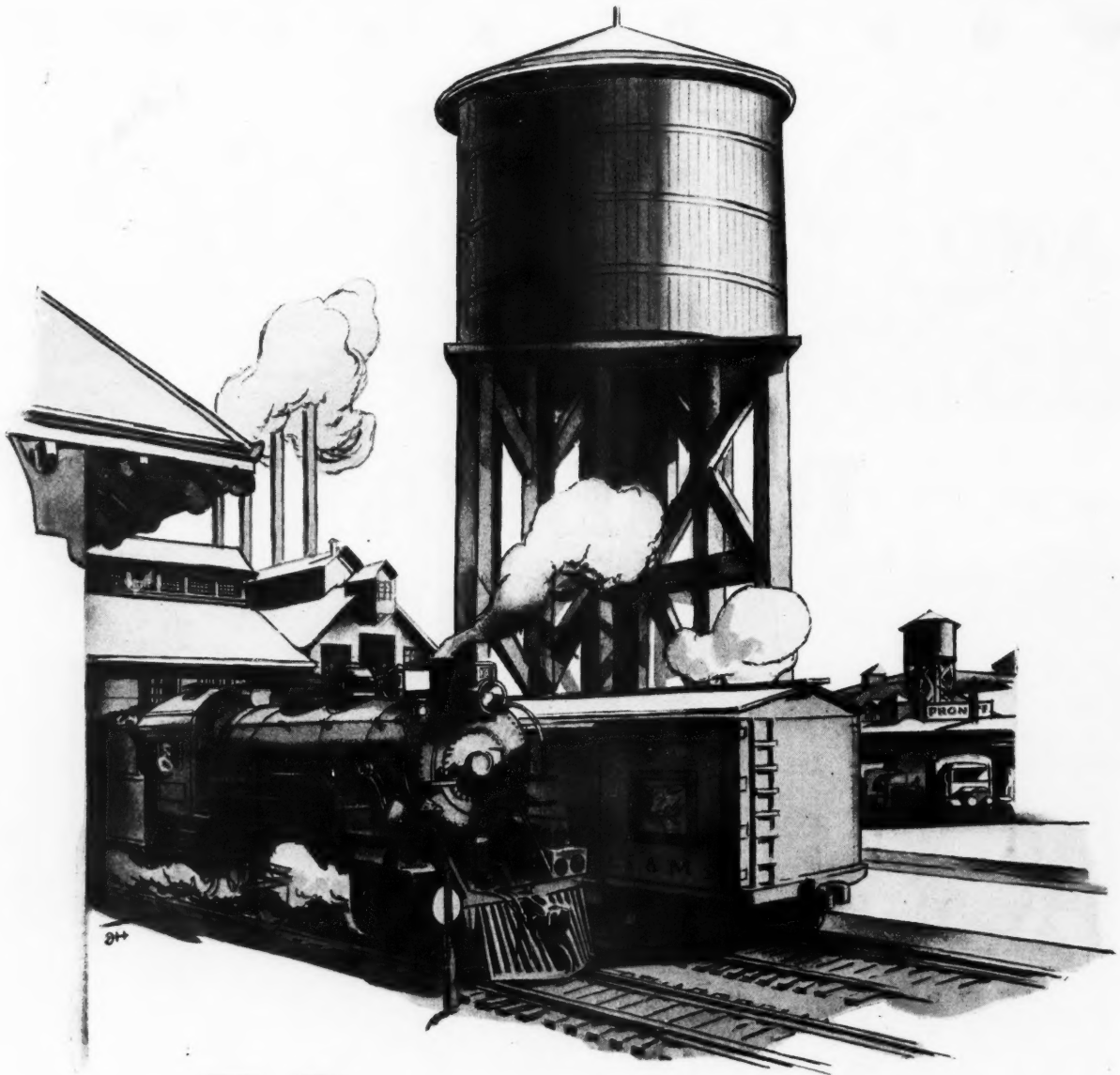
# AND Mudge

## RAILWAY MOTOR CARS

**Fairmont M2**  
Master Section Car seats 10 men; top raises for adjustments; 6 H. P. engine; Endless Cord Belt Drive

**FAIRMOUNT AND MUDGE PRODUCTS**

<b>SECTION MOTOR CARS</b> A2-M2-S2-M14-WS2	<b>PUSH CARS AND TRAILERS</b> T1-T2-T3-T12-T20 -T24-T25
<b>INSPECTION MOTOR CARS</b> E14-C1-M19-MM9	<b>ROLLER AXLE BEARINGS</b> Ringseal-Axisaver-Bower -Hyatt-Timken
<b>WEED MOWERS AND DISCS</b> M24-M25	<b>MOTOR CAR ENGINES</b> QB-PHB-PHA-QHB and W
<b>WEED BURNERS</b> B(M27)-C(M27)	<b>WHEELS AND AXLES</b>
<b>GANG AND POWER CARS</b> 45-AT2-MT2-ST2-WS3	



# VICTORIOUS!...

in 36,500 battles against rain and rot... heat and cold

In a century there are 36,500 days. And in hundreds of century-old Tidewater Red Cypress structures, the original wood has fought and won 36,500 battles against rain and rot... heat and cold.

Year by year, railroads are using more Tidewater Red Cypress on structures that must fight weather.

And mile by mile, they are shaving down the number of dollars needed to operate their lines. For this durable lumber doesn't know replacement.

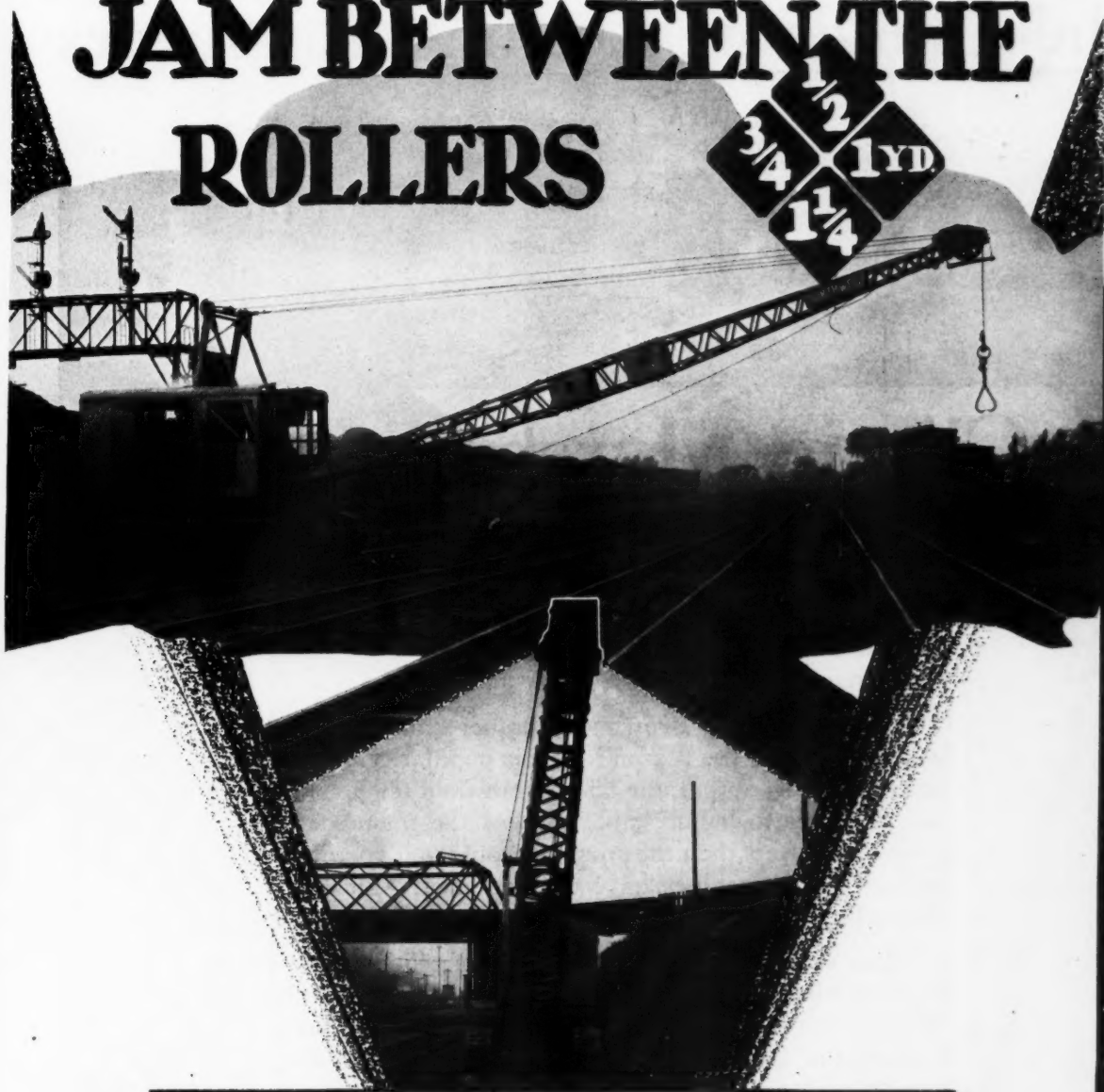
Grown in water, Tidewater Red Cypress resists water. Fortified naturally with "cypressene," it fights off rot. No wonder, then, that railroad men find it especially adapted for pas-

senger station construction, freight sheds, warehouses, ties, platforms, signal conduits, water tanks, box cars, fencing, and for wherever else its long life can insure freedom from repairs.

Technical data will be supplied gladly by the Southern Cypress Manufacturers' Association of Jacksonville, Florida.

## TIDEWATER RED CYPRESS

# NORTHWEST TREADS CAN'T BUCKLE UP AND JAM BETWEEN THE ROLLERS



## NORTHWEST

**Northwest Engineering Co.**

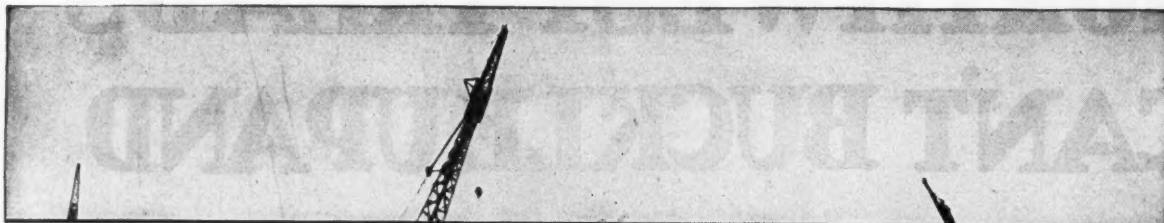
The world's largest exclusive builders of gasoline and electric powered shovels, cranes and draglines

1701 Steger Bldg. 28 E. Jackson Blvd.  
Chicago, Ill., U. S. A.

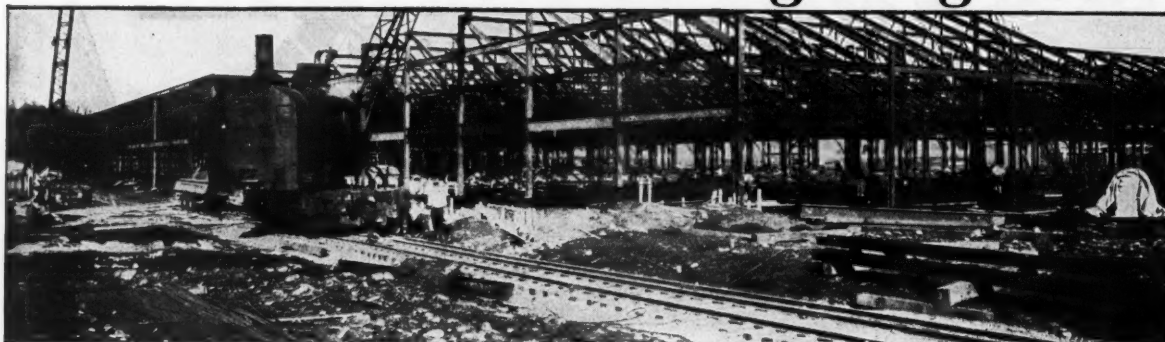
RE&M 8-Gray

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## The Choice of Leading Engineers



## McClintic Marshall Uses 33

McClintic Marshall is another of a long list of engineering concerns that have bought one Industrial Brownhoist and expressed their satisfaction in it by repeat orders. Today this company owns and operates 33 railroad and crawler type machines on their many construction projects.

To see Industrial Brownhoist cranes and shovels at work is to know the reason for their popularity. You'd notice their big output, the operators would tell you how easy they are to handle and how low the maintenance costs are. And then the owners would tell you of the savings their machines have effected—many Industrial Brownhoists have paid for themselves in 6 to 12 months.

When you judge material handling machinery solely on its merits you will readily understand why McClintic Marshall owns 33 Industrial Brownhoists. Boiled down, it means that no one makes a mistake by choosing quality.

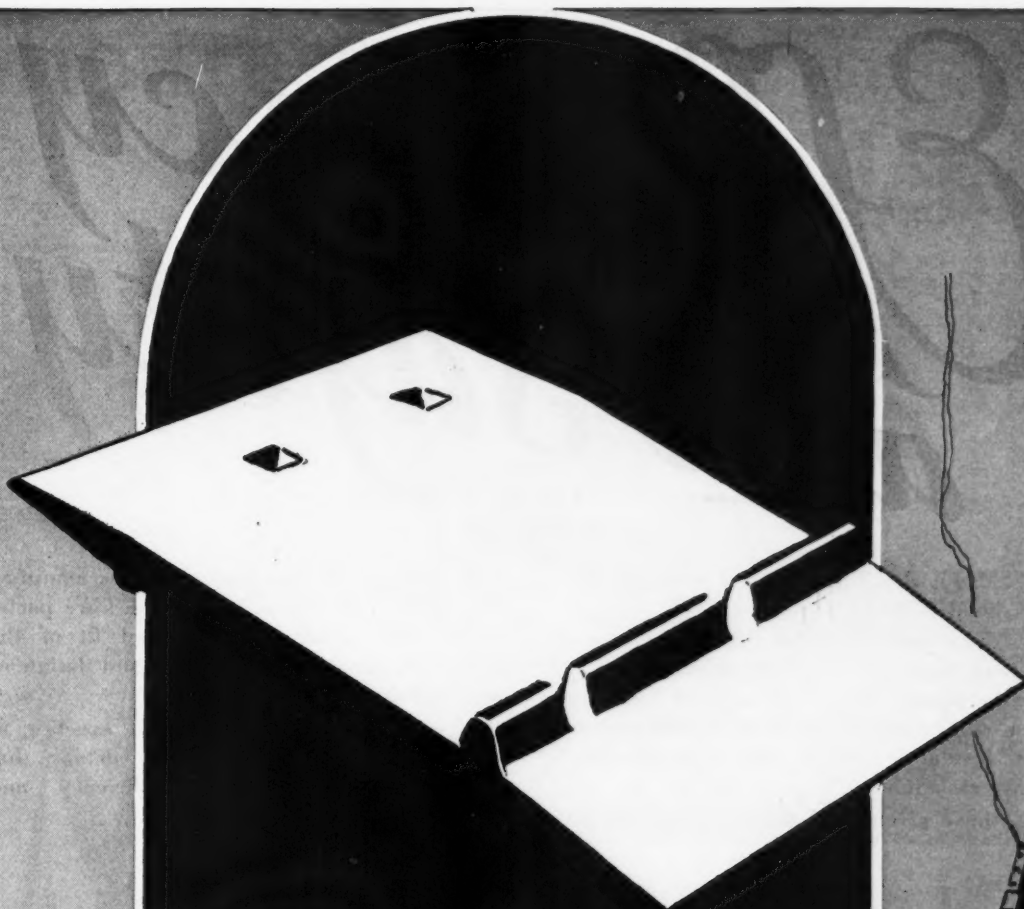
May our nearby representative call and give you additional facts, and show you how an Industrial Brownhoist crane or shovel would increase your profits?

Industrial Brownhoist Corporation, General Offices, Cleveland, Ohio

District Offices: New York, Philadelphia, Pittsburgh, Detroit, Chicago, New Orleans, San Francisco.

Plants: Brownhoist Division, Cleveland; Industrial Division, Bay City, Michigan; Elyria Foundry Division, Elyria, Ohio.

# INDUSTRIAL BROWNHOIST



# TIE PLATES

Made by a company with a thorough knowledge of track maintenance. . . . Illinois Steel Tie Plates imbed themselves into the tie without any injury to its fibres. . . . Careful inspection guarantees uniform quality.

From the time they are received until the time shipment is made, your orders—placed with the Illinois Steel Company—are handled by men trained in the requirements of railroad business.

**Illinois Steel Company**

Subsidiary of United States Steel Corporation

General Offices: 2111 South La Salle Street  
Chicago, Illinois

# Efficiency and Safety

**A** SMALL detail overlooked might cause a signal failure.

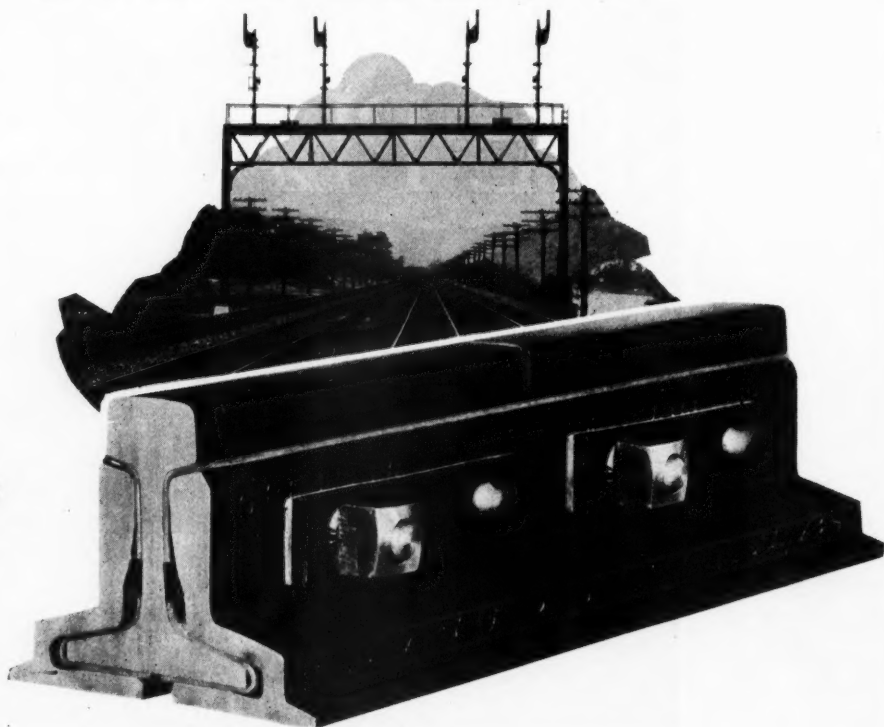
We have specialized for 35 years in the design and manufacture of insulated rail joints, with the thought always in mind of the importance of its mission, which is twofold—an efficient insulating device and a mechanically strong track joint.

We have given, and shall continue to give,

study and attention to such things as manufacture, quality, design and fit of the fibre parts; manufacture, quality, design and fit of the joint bars; manufacture, quality and design of bolts and nuts.

Experience has taught us to be exacting in our requirements in the small details that mean so much towards efficiency and safety.

**CONTINUOUS  
INSULATED  
JOINT**

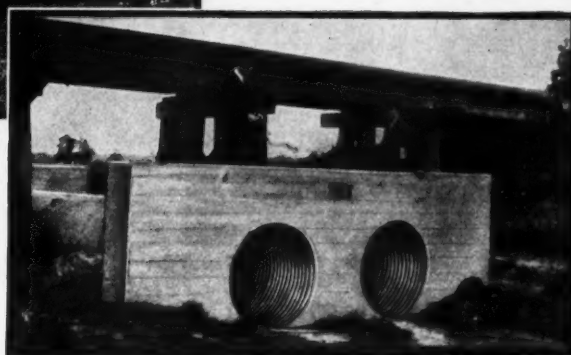
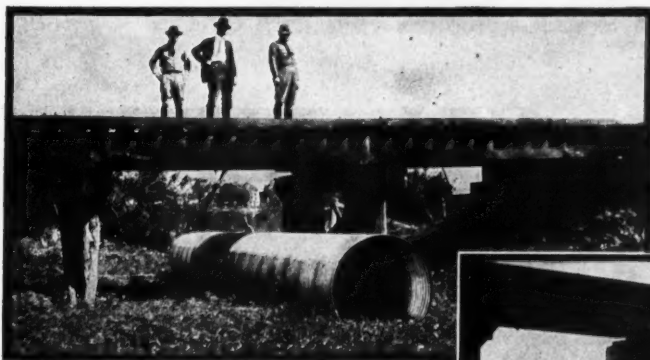


**THE RAIL JOINT COMPANY**

165 Broadway — New York City

*Always a Better Rail Fastening*

# The trestles were unsafe—obsolete



*Now* ARMCO culvert bridges  
carry the fills straight through

OLD trestles are often a serious problem in railway maintenance. None too safe, after years of service—constant inspection and repair are essential. Rebuilding the trestle is difficult and expensive.

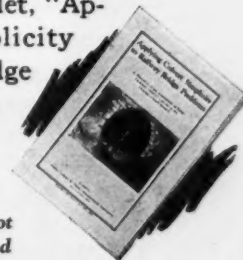
Many railways have eliminated trestles in favor of continuous fills with ample waterways provided by Armco Culverts. This change is easily made. The pipe is put in

place and the fill dumped over it. The dangerous trestle becomes a safe, continuous fill. The job quickly pays for itself because upkeep is eliminated.

You will find many valuable suggestions in the booklet, "Applying Culvert Simplicity to Railway Bridge Problems." A copy mailed on request.



Armco culverts and drains are manufactured from the Armco Ingot Iron of The American Rolling Mill Company and always bear its brand



ARMCO CULVERT MANUFACTURERS ASSOCIATION  
MIDDLETOWN, OHIO

# ARMCO CULVERTS

# P&H

## 1/2 CU. YD.

# EXCAVATOR

Contractors in need of a fast, powerful, small excavator find in P & H Model 300-A a 1/2-yard machine of heavy construction and as fully developed as the larger P & H models. All main frames are heavy Unit Steel Castings. The motor is 50 H. P. — the line and swing speeds are exceptionally high. Equipped as Shovel, Model 300-A weighs 47,000 lbs. — as a Dragline, 41,000 lbs. — a real 1/2-yard machine that will stand up in severe service. Bulletin GH-3 — sent on request — covers it in detail.

### HARNISCHFEGER CORPORATION

Established in 1884

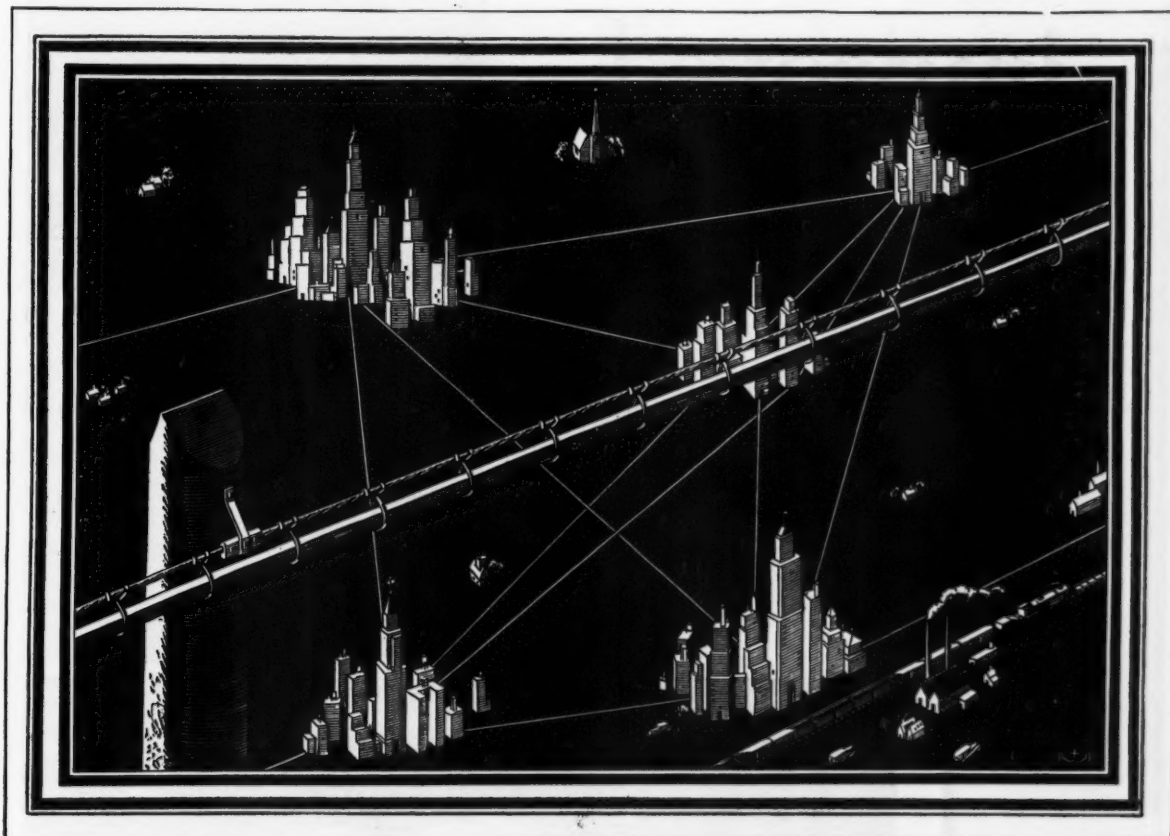
3820 National Avenue, Milwaukee, Wis.

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Philadelphia	Kansas City	Detroit	Los Angeles	Charlestown
Birmingham	San Francisco	Dallas	Des Moines	
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WAREHOUSES AND SERVICE STATIONS  
San Francisco, Los Angeles, Seattle, Dallas  
Philadelphia, Memphis, Jacksonville



# How Easy it is to Telephone between Cities



WHETHER it is a call to the next block or to another city, the telephone instrument on your desk is always ready. And it is easy to use. On calls to nearby cities, the operator will usually get the wanted telephone while you hold the line.

The simple act of using the telephone is often more effective than a trip in person. The representative of a Richmond grain company traveled 100 miles several times to call personally on a buyer without success. Then he called him by telephone—and sold him a carload of wheat. Cost of the call, 70c.

An Atlanta commission house started 10 carloads of potatoes across from Memphis. While the cars were rolling, 9 of them were sold by telephone in towns along the way. The last car was sold by telephone in Atlanta. Sales, \$10,000. Cost of calls, \$5.45.

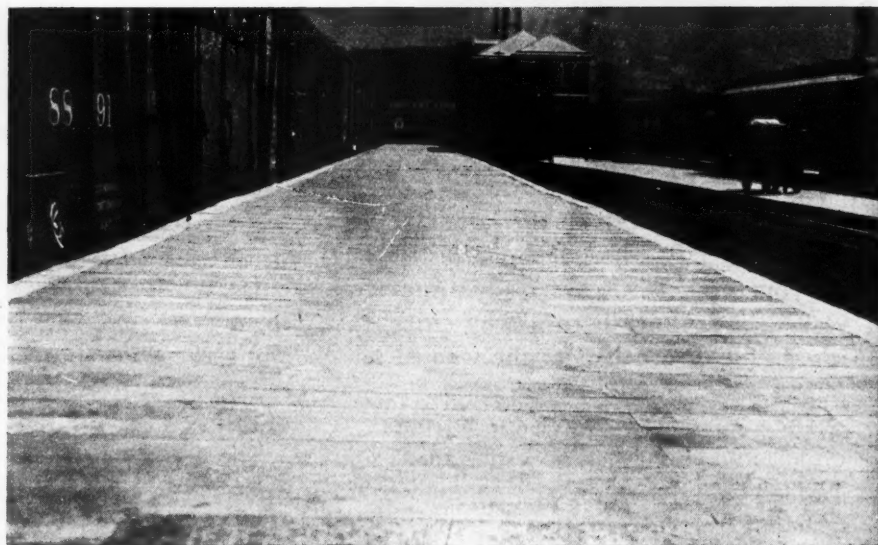
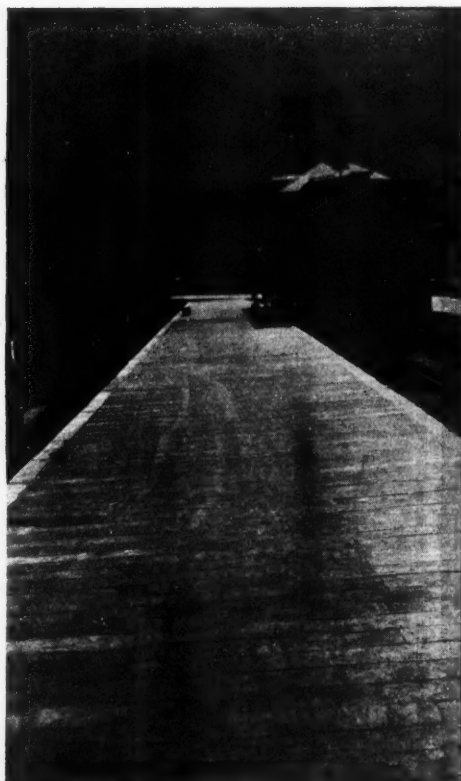
The telephone habit is good for business men in every line. It is so convenient. What calls could you profitably make to other cities now?

Calling by number takes less time.  
Bell Telephone Service is *Convenient*  
..... *Economical* ..... *Universal*.



# For an improved ...this improved

*Showing a typical finished installation of Carey Elastite Asphalt Plank, on a loading platform in West Virginia. The surface will be smooth for a long time, because this remarkable flooring actually improves with time and traffic.*



THE PHILIP CAREY

## loading platform

# ELASTITE Plank!

A SMOOTH, noiseless, unmarred paving—a paving that actually knits and heals under the hammering of traffic. A paving which won't soften in mid-summer or become brittle in the dead of winter—a paving which can be easily and economically installed over practically any kind of base . . .

That's Carey Elastite Asphalt Plank!

A fibrous and mineral asphaltic compound, pre-formed into tough planks of practically any desired thickness, length or width. Get the facts on this improved Elastite flooring—discover how you can use it to improve traffic surfaces and cut down maintenance costs.

Also manufacturers of Carey Elastite Expansion Joint, Carey Elastite System of Track Insulation, Carey Elastite Trunking and Carey Elastite System of Waterproofing.

**Carey Elastite**  
TRADE MARK REGD. U.S. PATENT OFFICE  
**PRODUCTS**

COMPANY — Lockland, CINCINNATI, OHIO



# an economic force pitted against waste *— wherever wheels and shafts turn*

**A** BASIC idea thirty years ago, "Timken Bearing Equipped" is today an economic force pitted against waste ... typifying a huge replacement program which sweeps all before it.

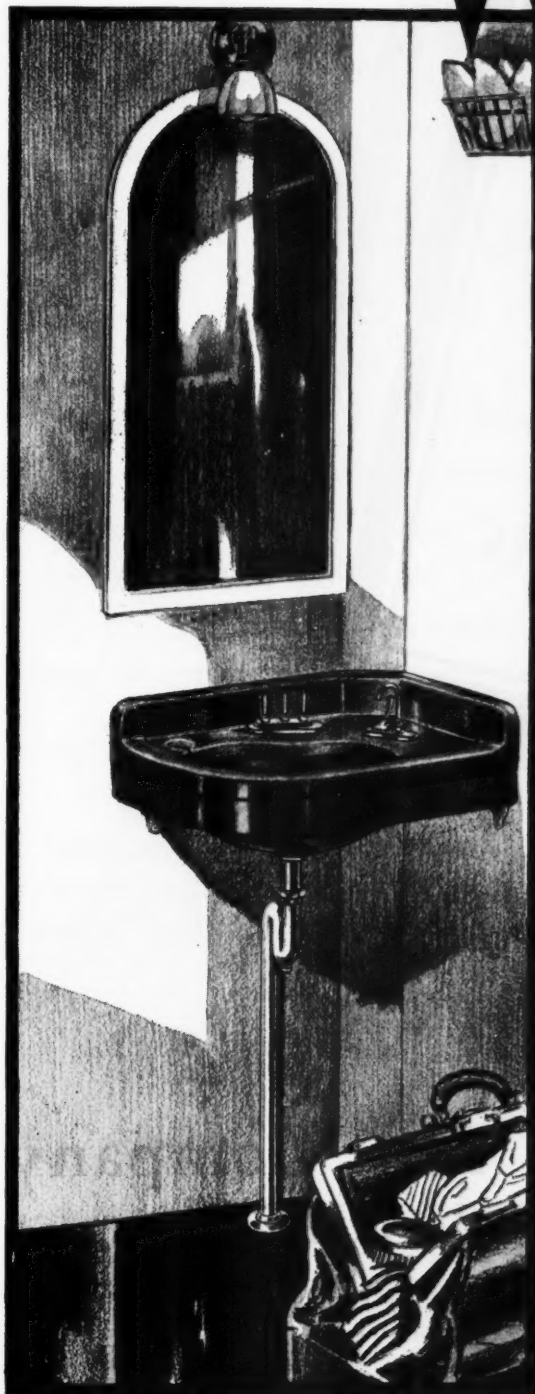
As in all industry, railroad operators find in Timken *a bearing that does all things well* ... whether the loads are all *radial* ... all *thrust* ... or a *combination of both*.

Rolling stock, inspection cars, section cars, gas-electric coaches, turn-tables, car retarders ... all have yielded to the tremendous power and lubrication savings, maintenance elimination and endurance made possible only by the exclusive combination of Timken tapered construction ... Timken *POSITIVELY ALIGNED ROLLS* ... and Timken steel.

"Timken-Equipped" represents the difference between waste and conservation, between antiquated and modern ... a deciding factor in building and buying mechanical equipment ... wherever wheels and shafts turn.

THE TIMKEN ROLLER BEARING COMPANY  
C A N T O N , O H I O

**TIMKEN** Tapered  
Roller **BEARINGS**



# What is it those who travel want?

Specifically, in plumbing fixtures they desire a quality of manufacture and a beauty of design that finds its equal in the plumbing fixtures in their homes. As a people we are proud of the bathrooms that our homes contain—and justly so. For the plumbing fixtures of this country are world-famous for their quality.

Many homes today are equipped with plumbing fixtures in color. Your better trains, if equipped with "Standard" Plumbing Fixtures in color, will win new praises from your patrons. They will be quick to see that you have provided for their use and comfort not only that which is newest and most modern, but also that which is most beautiful and pleasing.

There is an indescribable satisfaction that accompanies the use of "Standard" Plumbing Fixtures of genuine vitreous china. This appreciation of the facilities your trains provide will find expression in friendly comment that will prove a valued publicity asset for the service your lines render.

May we send you further information about "Standard" Plumbing Fixtures for railway use? We believe you will find our catalogue of more than passing interest.

**Standard Sanitary Mfg. Co.**  
Railway Fixture Department  
PITTSBURGH

**"Standard"**  
PLUMBING FIXTURES

THE LARGEST MANUFACTURER OF PLUMBING FIXTURES IN THE WORLD

# SEND FOR THIS NEW CATALOG



Our nearest office will give immediate attention to your request for a No. 562 Catalog.

The most modern time-and-labor-saving pneumatic tools are illustrated and described in this catalog.

## Chicago Pneumatic Tool Company 6 East 44th St., NEW YORK

*Sales and Service Branches all over the World*

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Railroad Department Offices, 6 East 44th St., New York; 310 So. Michigan Ave., Chicago;  
1004 Mutual Building, Richmond, Va.; 175 First St., San Francisco.  
Terminal Tower, Cleveland



**W**HEN price is the determining factor in the sale of railway motor cars — there's a reason!

Price represents design, materials, construction, factory overhead and a fair profit. Of these elements factory overhead and profit must be maintained or the maker goes out of business. From where then, comes the cheap motor car? The only

chance to reduce price is by reducing factory cost of design, materials and construction at the ultimate expense of the purchaser.

The Sheffield policy is to furnish a car of lowest operating costs and longest life. Therefore, "Sheffield" cannot always be "cheap" in first cost.



**FAIRBANKS-MORSE**



**MOTOR  
CARS**

*First on the rails  
— and still first*

**FAIRBANKS-MORSE MOTOR CARS**

# A standard of value for 33 years

*"Sheffield"*

set the standard value for rail-  
way motor cars  
in 1896 with the first motor car on rails.

Practically every important motor car  
development since, that has established the trend  
in design and saved railroads time and money, has  
been contributed by Sheffield research and engineering.

Unlimited capital has always enabled Sheffield to give motor  
car users the benefit of quantity purchases of high grade materials at  
the low market price.

America's most completely equipped railroad motor car factory manufac-  
tures this quality stock in Sheffield advance designs at a low cost to railroads.

And a further saving is made from  
the performance of the car itself.

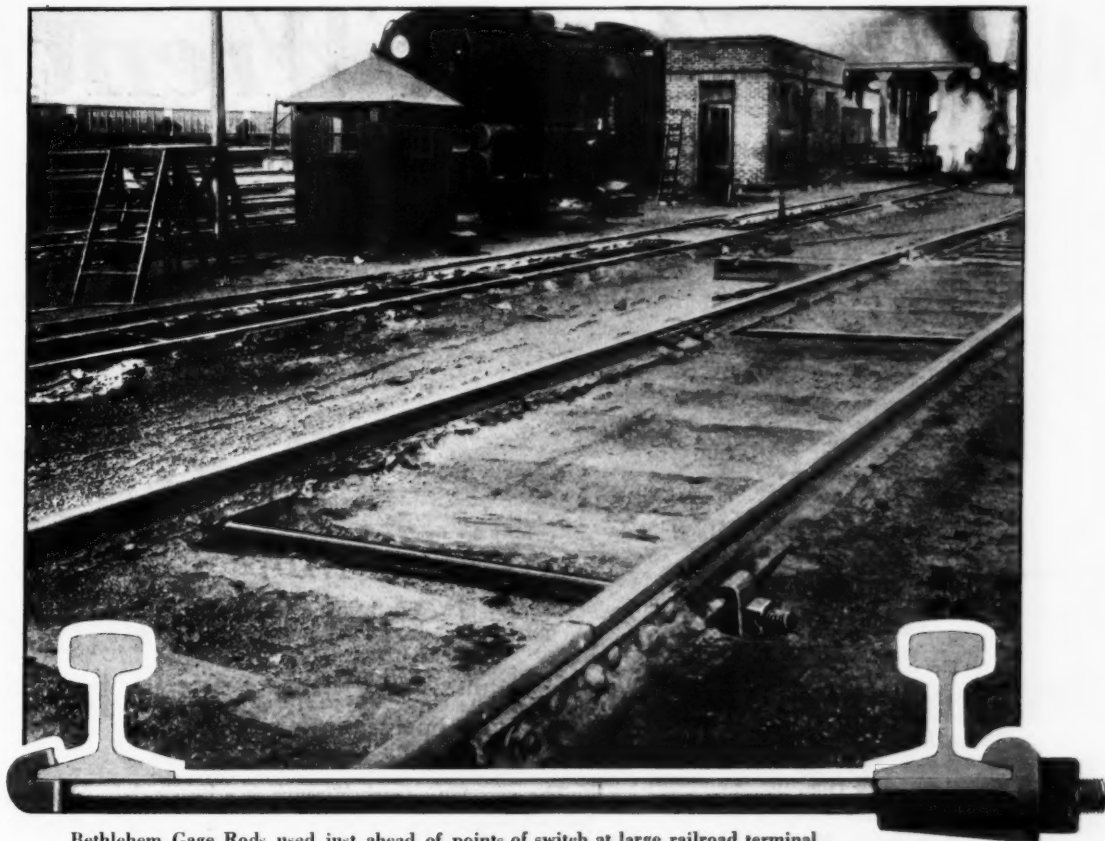
Service records on many important  
railroads in the United States prove  
that Sheffields have cost less than  
half as much to operate and main-  
tain as any other car for similar  
service.

FAIRBANKS, MORSE & CO., *Chicago*  
Manufacturers of railway motor cars;  
hand cars; push cars; velocipedes; stand-  
pipes for water and oil; tank fixtures;  
stationary and marine oil engines;  
steam, power and centrifugal pumps;  
scales; motors and generators; complete  
coaling stations

## FAIRBANKS-MORSE

## MOTOR CARS





Bethlehem Gage Rods used just ahead of points of switch at large railroad terminal.

## There is no "kicking out" with this Gage Rod

The Bethlehem Gage Rod provides a means of distributing the lateral thrust of the wheels and of holding the track in correct alignment, thus putting both rails to work and preventing undue strain on spikes, tie plates and ties. This equalization of strain on track fastenings reduces track maintenance costs by eliminating frequent regaging of track.

Wherever there is difficulty in holding track to gage, you can use the Bethlehem Gage Rod to advantage—on straight track under heavy traffic conditions, at switches, on temporary track, on turntable leads. It is especially important on curves, where it eliminates the tendency of the outside joints to "kick out."

The Bethlehem Gage Rod is a one-piece forging with a solid steel hook on one end and a heavy adjustable steel clip on the other end. It can be furnished either insulated or non-insulated. The non-insulated can be quickly changed to the insulated type by removing the standard adjustable clip and substituting the insulated clip. This feature is an important advantage on railroads that are being electrified.

### BETHLEHEM STEEL COMPANY

General Offices: BETHLEHEM, PA.

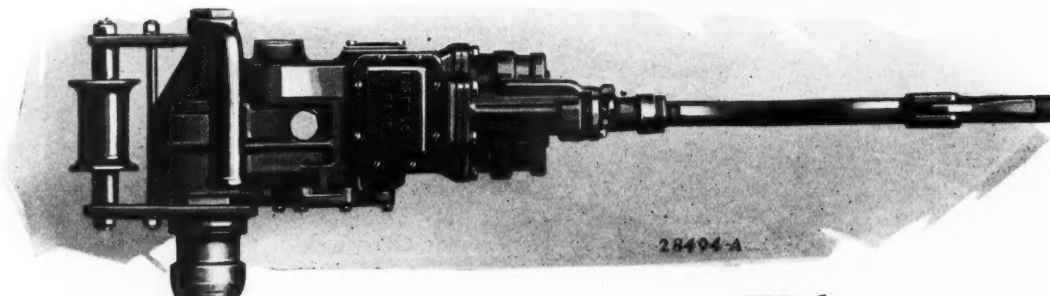
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Pittsburgh Buffalo Cleveland Detroit Cincinnati Chicago St.  
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Bethlehem Steel Export Corporation, 25 Broadway, New York  
City. Sole Exporters of Our Commercial Products

# BETHLEHEM

# A New Track Wrench

## —Pneumatic—



### Size 99C Pneumatic Track Wrench

This is the newest addition to the Ingersoll-Rand line of labor-aiding pneumatic track tools. These include Tie Tamperers, Spike Driver, Spike Pullers, Rail Drills, Bonding Drills, Wood Boreers, Riveters, Concrete Breakers, etc.

### With 50% More Power and Easier Handling

For running-on or backing-off track bolt nuts in rail laying operations.

The new 99C Track Wrench is a heavy duty machine, having much more power and torque than any other machine ever offered for this class of work. It is reversible and will properly tighten or run off even the largest sizes of track bolt nuts. It is recommended for use on all sizes of bolts and will insure tightly bolted up joints.

The wrench is fitted with a square end spindle for taking snap type chucks that find the nuts quickly. It is provided with a rail wheel for wheeling the machine along on the rail when moving from joint to joint; a handle grip on the spindle end for greater handling ease and an "S" shaped throttle handle extension to give greater leverage and to keep the operator's hand off the ties.



Four pneumatic wrenches operated from I.R Tie Tamper Compressor



INGERSOLL-RAND COMPANY

11 Broadway

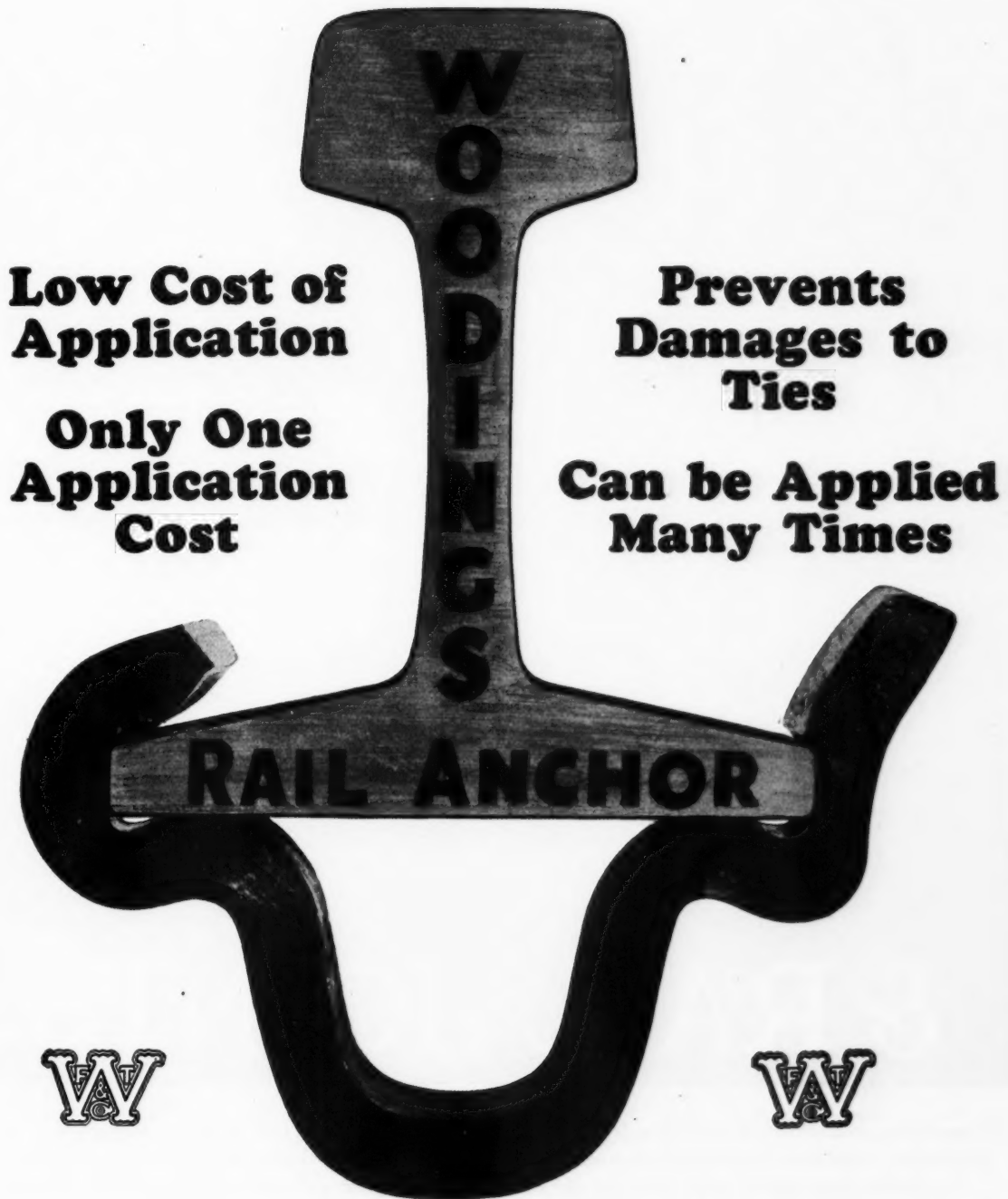
New York City

Branches or distributors in principal cities the world over  
For Canada Refer—Canadian Ingersoll-Rand Co., Limited,  
10 Phillips Square, Montreal, Quebec

# Ingersoll-Rand

268-TT

# Reduce Maintenance



## Woodings Forge & Tool Co.

Verona

*Works and General Offices*

Penn.

# CARNEGIE RAILS & RAIL JOINTS

Unlimited manufacturing facilities, from the mining of the ore until the finished product is ready for shipment, enable us to promptly and efficiently supply your steel requirements. Carnegie products of special interest to railroads include Rails and Rail Joints, Standard Structural Shapes, Carnegie Beam Sections, Bar Mill Products, Wrought Steel Wheels, Forged Steel Axles and Steel Sheet Piling. When immediate delivery is desired, our six conveniently located warehouses render admirable service. Let us quote on your next requirements.

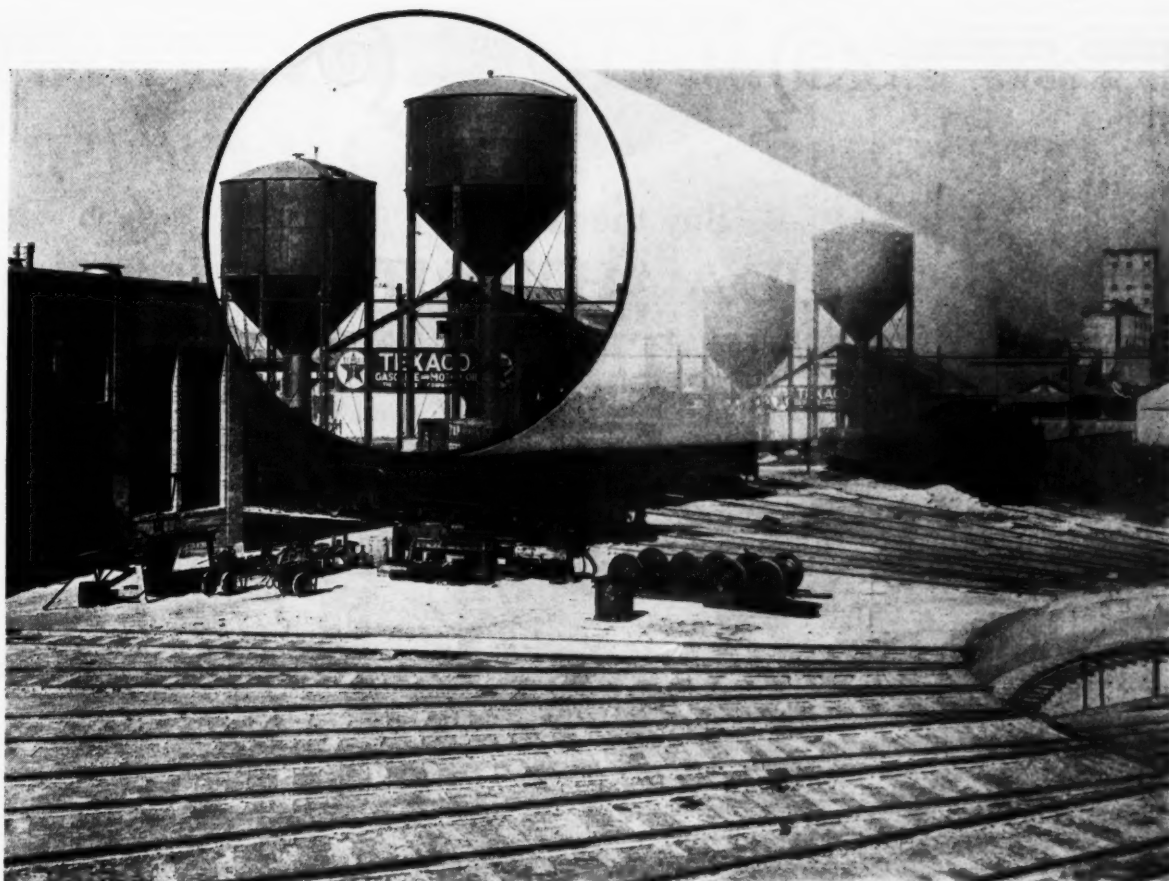


## CARNEGIE STEEL COMPANY

*Subsidiary of United States Steel Corporation*

PITTSBURGH, PA.





100,000-gallon water tank and 50,000-gallon oil tank at International-Great Northern terminal, San Antonio, Texas.

## Horton STEEL Tanks at Terminals

Horton steel tanks are found wherever railroads require water service. Not a few of them are located at terminals where they are used to supply locomotives with water at the start of long runs. On oil-burning roads, conical-bottom tanks are also used to deliver fuel oil to locomotives.

painting keeps a steel tank in first class condition.

Conical-bottom tanks are easy to clean. Settlings from the water collect in the small area at the bottom of the tank riser. The accumulated material is washed out through a valve, without taking the tank out of service.

Ask for a copy of the booklet illustrated at the left. It gives information on elevated and flat-bottom steel tanks for roadside delivery, water softening and oil storage service.

Steel tanks are economical. Being long lived, their first cost is spread over a long period of years. Maintenance costs are low, for repairs and replacement parts are few. Regular



Ask for a copy  
of this Booklet

B. 94

### CHICAGO BRIDGE & IRON WORKS

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New York.....3156 Hudson Term. Bldg.  
Cleveland.....2202 Union Trust Bldg.  
Dallas.....3309 Magnolia Bldg.

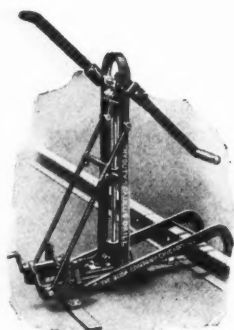
Detroit.....1519 Lafayette Bldg.  
Philadelphia.....1609 Jefferson Bldg.  
Atlanta.....1036 Healey Bldg.  
San Francisco.....1007 Rialto Bldg.

# HORTON TANKS

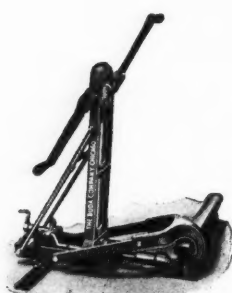


Buy the Genuine  
**BUDA "HYDUTY"**  
**PAULUS TRACK DRILL**

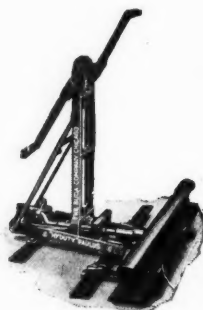
*Manufactured Only By The Buda Company*



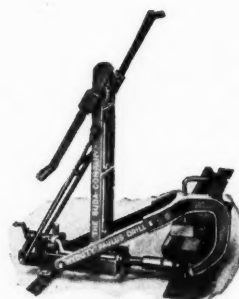
Type A



Type B

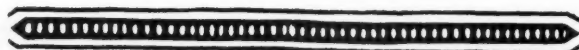


Type C



Type D

*Write for Bulletin No. 648*



Ball Bearing Journal Jacks, 25  
 35 and 50 Tons Capacity

## BUDA JACKS

Easy and Safe to  
 Operate—

Minimum Upkeep Cost

*Also Makers of Ball Bearing "Postop"  
 and Ratchet Jacks*



Ball Bearing Self Lowering  
 Jacks, 35, 50, 75 and 100  
 Tons Capacity

# THE BUDA COMPANY

HARVEY (Chicago Suburb) ILLINOIS

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 NEW YORK

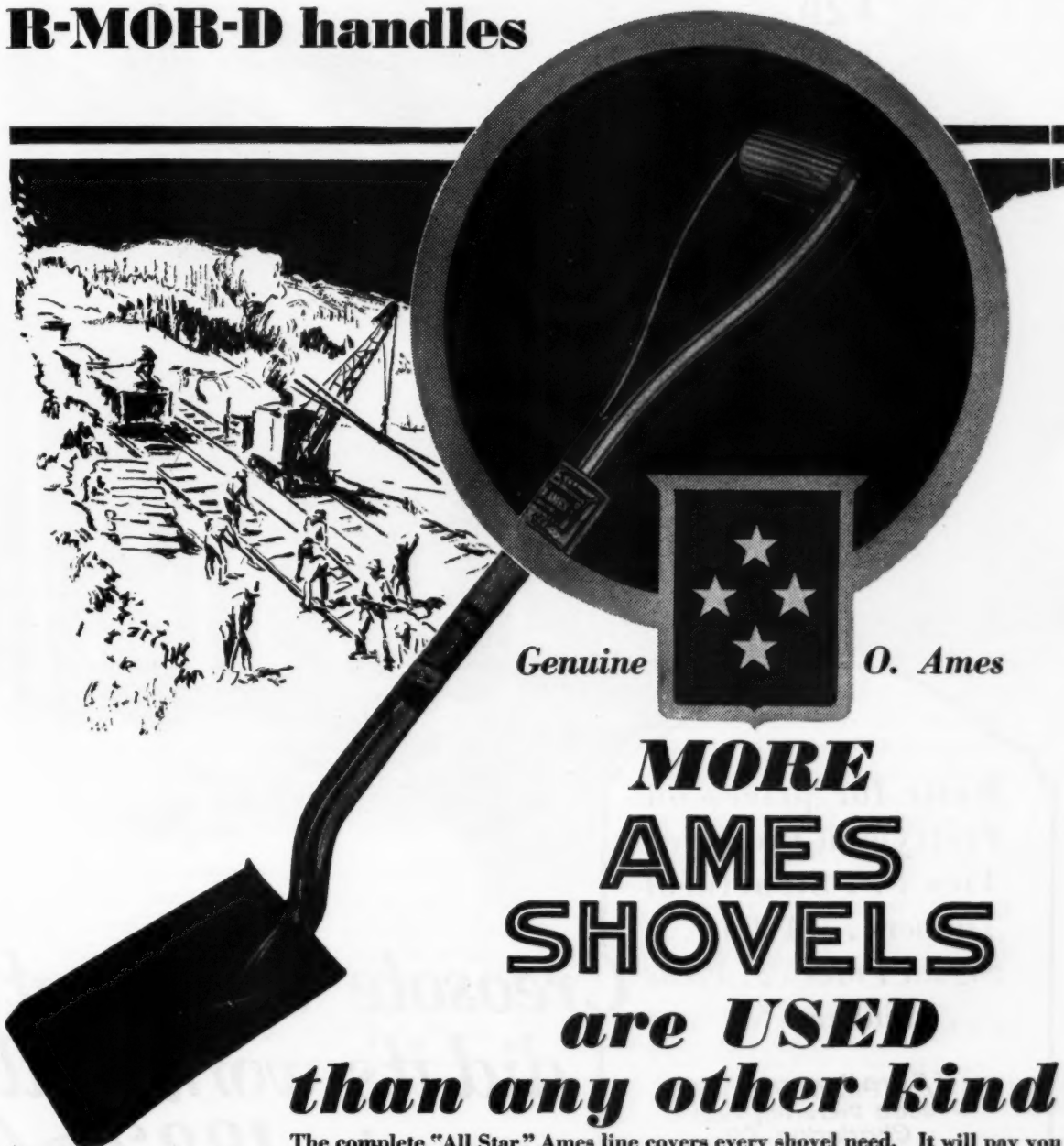
Railway Exchange  
 CHICAGO

Railway Exchange  
 ST. LOUIS

664 Mission Street  
 SAN FRANCISCO

Cecil Chambers, Strand  
 LONDON, W. C. 2

# Only AMES SHOVELS have R-MOR-D handles



Genuine

O. Ames

## MORE AMES SHOVELS

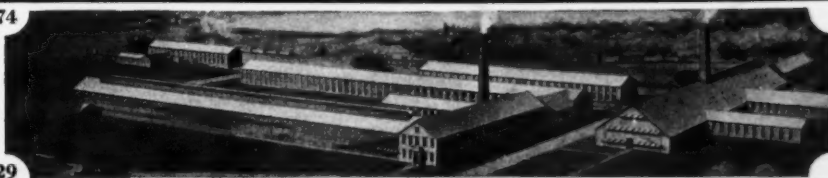
*are USED  
than any other kind*

The complete "All Star" Ames line covers every shovel need. It will pay you to "look for the stars" on every shovel you buy.



1774

1929

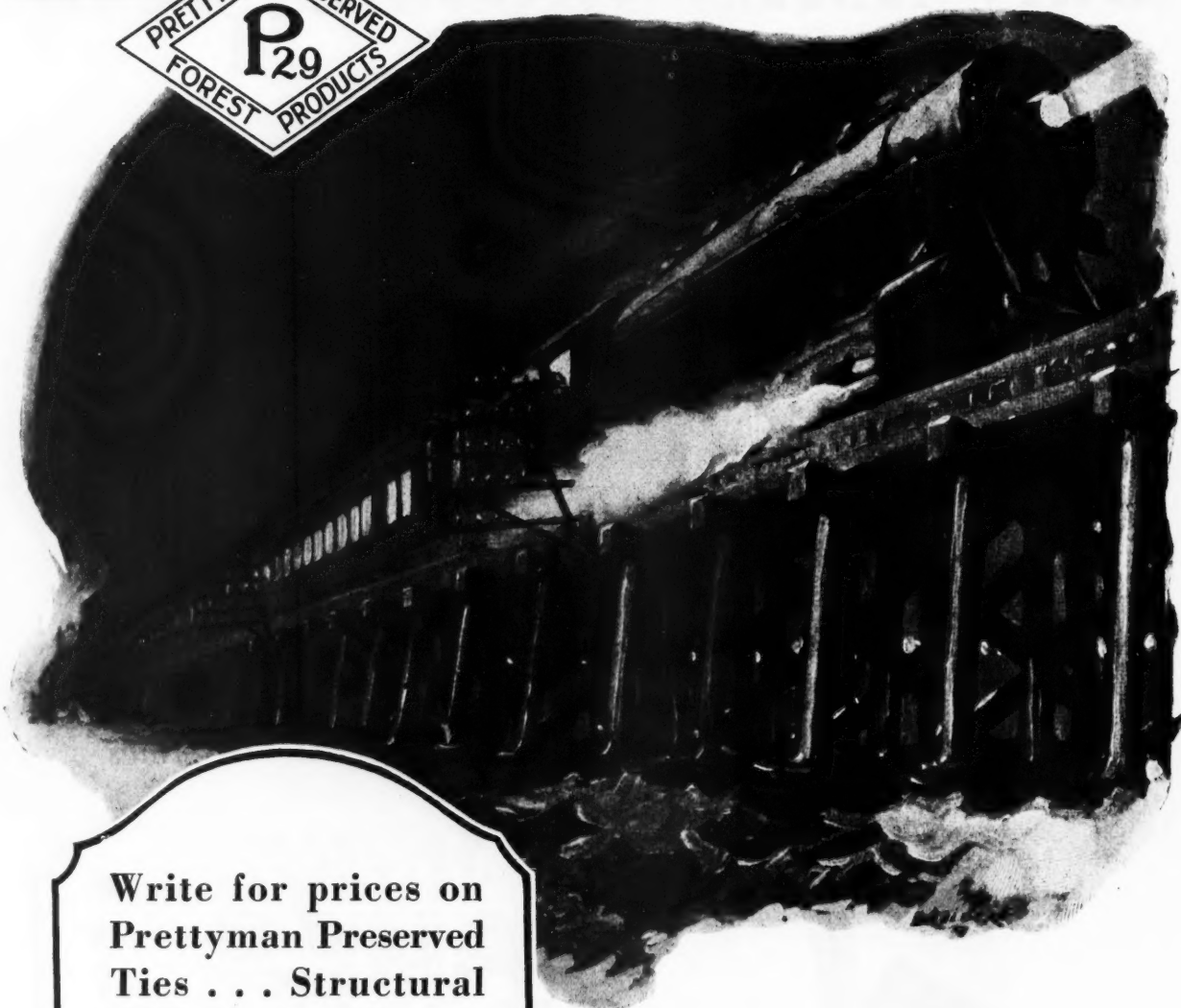


### AMES SHOVEL AND TOOL COMPANY

NORTH EASTON «» MASSACHUSETTS

ST. LOUIS, MISSOURI . . . . ANDERSON, INDIANA

3061



Write for prices on  
Prettyman Preserved  
Ties . . . Structural  
Timbers . . . Piling . . .  
Signal Poles . . . Posts  
. . . Lumber.

*J.F. Prettyman & Sons*  
Wood Preserving Plant  
Charleston, S.C.

*Creosote treatment  
did it's work well  
even in 1882~*

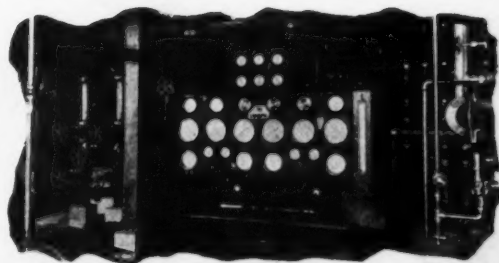
## *~it does it better now...*

**T**imbers treated for the Lake Pontchartrain (La.) trestle of the N. O. & N. E. Railroad in 1882 and 1883, in a small creosoting plant built nearby for the purpose, were inspected in 1918 by valuation engineers of the Interstate Commerce Commission and pronounced not only sound, but good for 35 years more in service. The life of the trestle was thus estimated at 70 years.

The timber creosoting industry has progressed since 1882. Forty-seven years of experience, study and research have increased its efficiency . . . refined its methods . . . improved its equipment.

Specifications for creosote oil have changed. Today, in the modern wood preserving plant, complete laboratory control obtains throughout production . . . from seasoning yard to finished product.

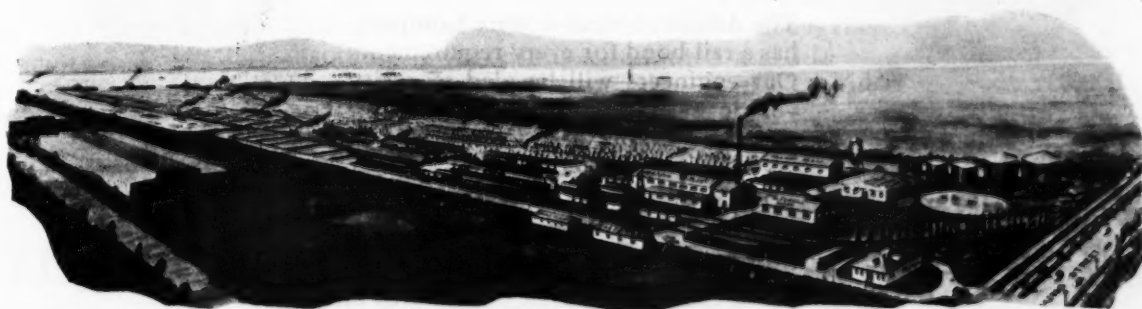
Precision scales have superseded the old-time method whereby the quantity of preservative injected was determined by volume. Highly sensitive indicating instruments keep the treating engineer posted as to temperature, pressure and vacuum throughout the treating operation. Precise recording instruments make permanent



records of each of these things for every cylinder charge treated. Guess work has given way to accurate information. Rule-of-Thumb is no more . . . that is, in the modern creosoting plant.

The Prettyman wood preserving plant, designed by Grant B. Shipley and completed in August, 1927, represents all that is modern and efficient in the industry. It commands its own raw material resources of 60,000 acres of Southern Yellow Pine and enjoys excellent shipping facilities by rail and water. Write for prices and information.

*J.F. Prettyman & Sons*  
Wood Preserving Plant  
Charleston, S. C.



# Safer Bonds

## American Signal Bonds

### A TEST

In order to disprove that the wires in our American Stranded Signal Bonds are adversely affected by the welding heat, we had this examination made. The extreme heat localization which is effected by our process is clearly illustrated in the following micro-photographs. Photograph No. 1971 shows the weld under low magnification. Photograph No. 1956 shows the structure of the steel adjacent to the weld along the wires. Photograph No. 1965 shows the normal structure of the wires which is found at .2 cm. from the weld. It is very interesting to note that the grain structure of the wires is refined immediately adjacent to the welds, instead of coarsened, as would be the case if the wires were overheated. This refinement is obtained by performing work upon the wire while hot. Consequently, we obtain a refinement of the metal adjacent to the welds and maintain the normal structure to within .2 cm. from the welds.

The Type DS-1 Bond is made with the usual steel pin and two conductors, each conductor composed of one central copper wire surrounded by six galvanized steel wires.

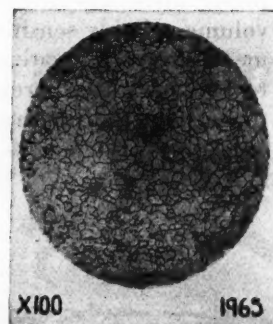
The Type S-1 Bond is made with the usual steel terminal and one conductor composed of one central copper wire surrounded by six galvanized steel wires.



No. 1956 shows the structure of the steel adjacent to the weld along the wires.



No. 1971 shows the weld under low magnification.



No. 1965 shows the normal structure of the wires which is found at .2 cm. from the weld.

The American Steel & Wire Company has a rail bond for every requirement. Our engineers will be glad to assist you in selecting the best bond for your needs.

## American Steel & Wire Company

*Subsidiary of United States Steel Corporation*

208 S. La Salle Street, Chicago

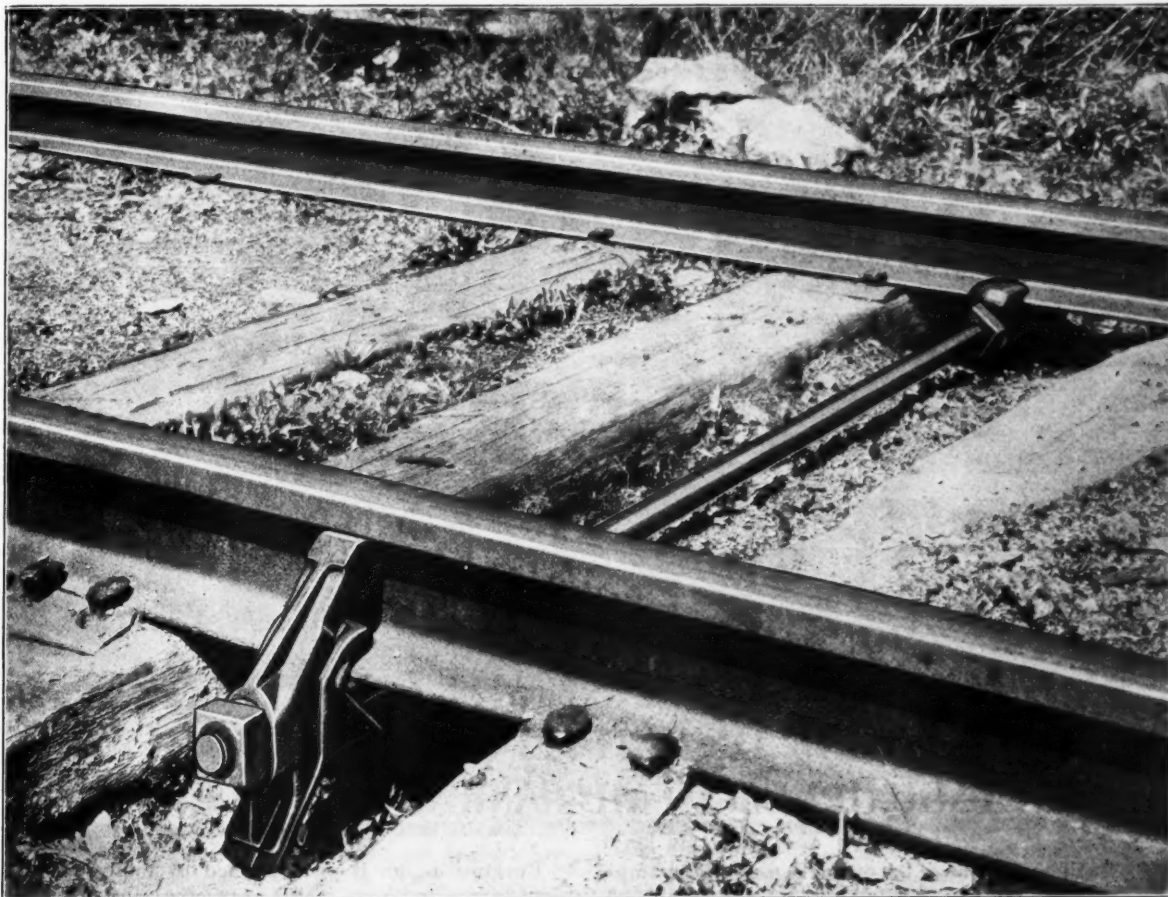
30 Church Street, New York

Other Sales Offices: Boston Cleveland Worcester Philadelphia Pittsburgh Buffalo Detroit Cincinnati Baltimore  
Wilkes-Barre St. Louis Kansas City Minneapolis-St. Paul Oklahoma City Birmingham Atlanta Memphis Dallas Denver Salt Lake City  
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# WHEEL SHOCKS HARNESSED

---



## By The New Coover Shock Absorber

Employing a New Coover Shock Absorber Clutch on the outside of rails . . . with a Standard Coover Clutch on the inside . . . makes a combination hard to B-E-A-T.

Each Shock as registered is so utilized that it tightens the grip on rails, of each member of the clutch . . . and is thus practically absorbed.

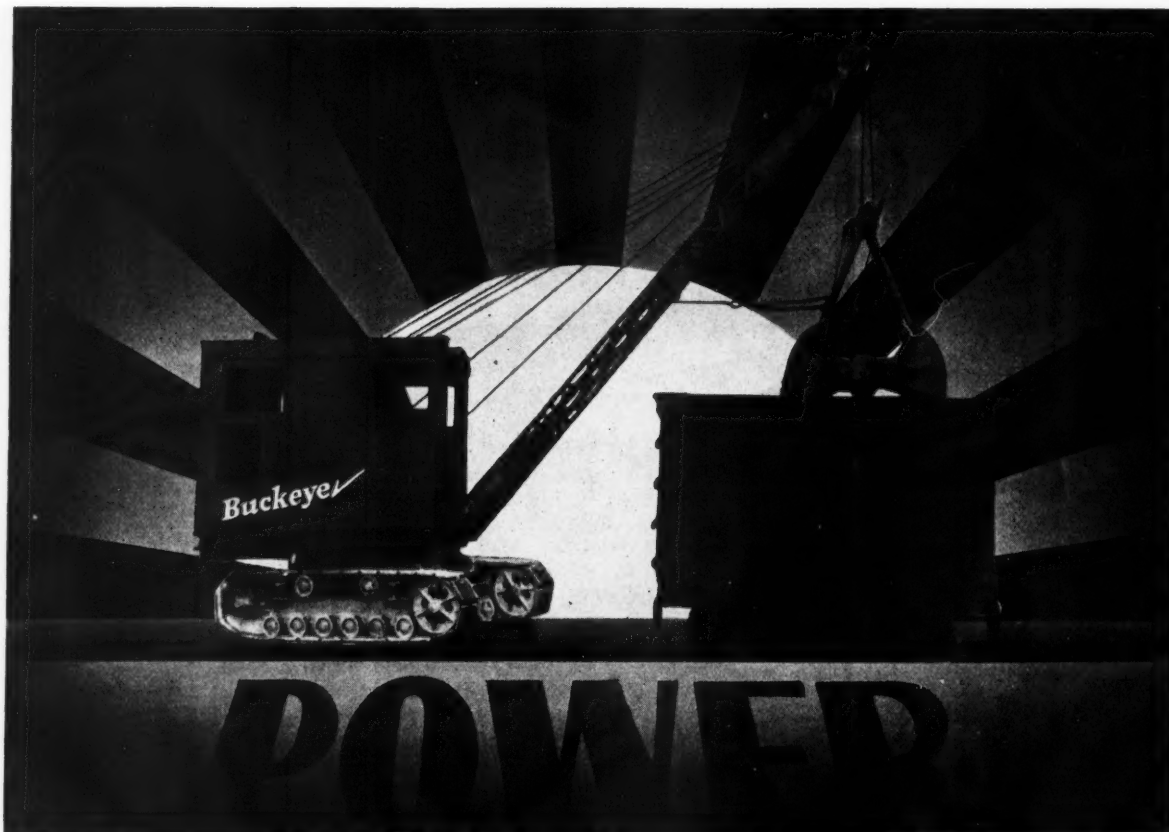
What a Stabilizer is to an Automobile . . . The Coover Shock Absorber will be to your road-bed. Each part of the track is strengthened, derailments are prevented, respiking is materially eliminated and life of ties doubled.

Wheel Shocks are so harnessed that even the most stubborn point in your track will permit the operation of faster, heavier and smoother running trains, with at least a fifty per cent reduction in your maintenance costs.

---

**THE COOVER RAILROAD TRACK BRACE CO.**  
DAYTON, OHIO

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## A REFLECTION OF INBUILT WORKING ABILITY *plus* A SOUND, RUGGED MECHANICAL CONSTRUCTION

Plenty of power for ordinary use plus an ample reserve for emergencies is the secret of the efficiency of the versatile Buckeye Utility Crane. It requires thoroughly dependable power and a sound, rugged construction to deliver the variety of service that the Buckeye renders. As clamshell, dragline, orange-peel or crane, it will profitably perform such engineering and maintenance work as excavations; handling frogs, switches or other construction material; and loading or unloading concrete aggregates, coal, cinders, ballast, scrap, etc. Well-planned operation can always find a job for this Buckeye, that is why "Every Day It Pays Its Way".

Buckeye design is distinguished by many operating conveniences and construction features. Among these are: All principal shaftings specially heat-treated and ground for precision; Timken roller bearings; adjustable length boom; medium speed industrial type motor and adequate heavy-duty transmission; two speeds for all operations; full-circle swing; and complete one-man control. This Utility Crane is available in two mountings—*Flanged Wheels* to permit operation directly from track or from rails laid on flat cars, and *Alligator (Crawler) Traction* for service independent of track. Write for our interesting Crane Bulletin.

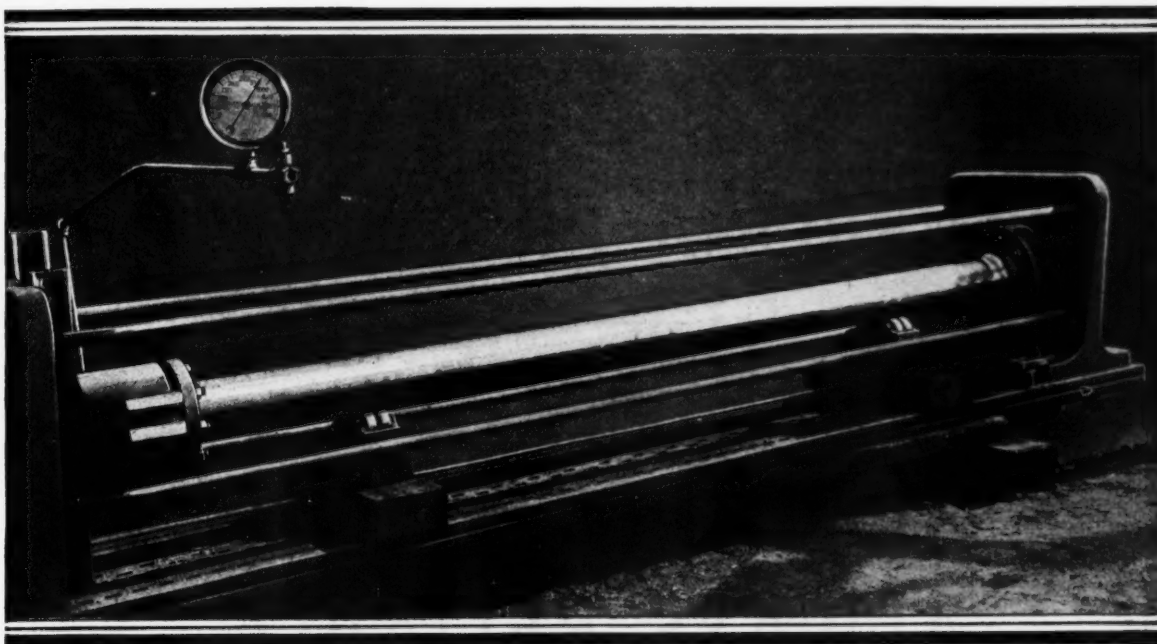
THE BUCKEYE TRACTION DITCHER COMPANY  
FINDLAY, OHIO

*There's a Buckeye Sales and Service Office Near You*

*for over thirty years*  
**Buckeye** ✓



## *Dramatic Evidence* of the superior strength of deLavaud pipe



*The above photograph was taken during a hydrostatic bursting test of deLavaud Pipe. Details below.*

3,350 lbs. per square inch was the pressure required to burst the 6-inch deLavaud Pipe shown above. This pipe was selected at random from stock, placed in a special test press and submitted to tremendous water pressure from a force pump. Gauge readings were accurately checked.

When the pressure was first applied, the gauge needle moved up quickly to the 2,000 lb. mark. Thereafter it advanced more slowly to a reading of 3,350 lbs. per square inch—a pressure reading fully 25% higher than could possibly be obtained with pit cast pipe designed for the same service.

The remarkable strength of deLavaud Pipe is due to the dense, close grained structure of the metal, and to the metal's freedom from slag and blow holes. deLavaud Pipe is made by pouring molten iron into a rapidly revolving cylindrical mould. Centrifugal force holds metal against sides of mould, driving out impurities with a pressure resulting from a force 40 times greater than gravity.

Also, the action of water-cooled deLavaud mould and the subsequent annealing further improve the physical properties and the microstructure of the metal. Let us send you the deLavaud handbook and all the facts about deLavaud Pipe.



Cast iron pipe made by this Company bears the "Q-check" trademark of The Cast Iron Pipe Research Association.

# **United States Pipe and Foundry Co., Burlington, New Jersey**

Sales Offices:  
New York

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Birmingham  
Kansas City

Minneapolis  
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Los Angeles

# Vacation Season

*But Not For*

**VERONA TOOLS**

*and*

**VERONA PRODUCTS**

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*they are*

**ALWAYS on the JOB**

**ALWAYS RELIABLE**

**ALWAYS DEPENDABLE**

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If You Want Tools That

Do Not Take a Vacation

**BUY VERONA TOOLS**

**VERONA TOOL WORKS**

1800 First National Bank Building, Pittsburgh, Pa.

# Smaller Inventories



**S**TATISTICS recently compiled by the "Railway Age" indicate smaller stores inventories at the end of 1928 than of 1927 or any preceding year. At the computed annual carrying cost of  $18\frac{1}{2}\%$ , this reduction of stocks effected an economy in 1928 of \$10,000,000 as compared with 1927 and \$53,000,000 as compared with 1920.

During 1928 American railroads continued largely to increase their use of the oxwelding process, thus minimizing replacements and enabling operation with smaller inventories.

For more than 16 years The Oxweld Railroad Service Company has supplied the welding needs of a majority of the important railroads of the country. It is a vital factor in lowering railway operating costs.

## THE OXWELD RAILROAD SERVICE CO.

Unit of Union Carbide and Carbon Corporation



NEW YORK CITY

CHICAGO

Carbide and Carbon Bldg.

Carbide and Carbon Bldg.



## Travel Thousands of Miles

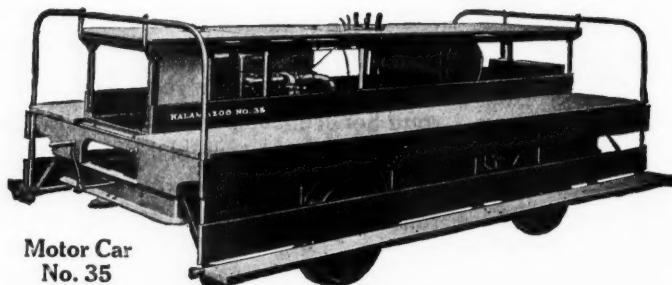
**K**ALAMAZOO motor cars travel thousands of miles to reach Foreign Countries which insist on having them because of their sturdiness, power and long life.

In every country where motor cars are used, Kalamazoos travel thousands of miles hauling gangs to and from work—hauling materials—making quick emergency trips.

Model 35 is illustrated below. It carries 30 men and trailers; is equipped with a 4 cylinder engine and has a speed of 2 to 30 miles per hour.

Descriptive circular on request.

*"Kalamazoo Means Service to You"*



Motor Car  
No. 35

# KALAMAZOO RAILWAY SUPPLY COMPANY

MANUFACTURERS—Established 1883

KALAMAZOO, MICHIGAN

# KREOLITE



## SOLID UPLAND MOUNTAIN OAK R. R. CROSS AND SWITCH TIES

The favorable location of our several Plants enables us to purchase solid Upland Mountain Oak to advantage.

The life of treated timber depends upon the character of the preservative used. **We distill our own Creosote Oil.** By so doing it is possible for us to insure to the purchaser a uniform pure product of

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Enormous stocks of Cross Ties, Switch Ties, Structural Timbers and Piling, in all sizes, in Solid Oak or Pine, properly sticked and air seasoned before treatment, available for prompt shipment from Toledo, Ohio, or our Midland Creosoting Company plant, Granite City, Ill. (East St. Louis).

**THE JENNISON-WRIGHT COMPANY, TOLEDO, OHIO**  
Branches in All Large Cities

# R. R. TIES

THE SIGNIFICANCE TO YOU OF THE MEMBERSHIP OF

# Railway Engineering and Maintenance

IN THE ASSOCIATED BUSINESS PAPERS, INC.

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2. To subscribe to and work for truth and honesty in all departments.
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4. To refuse to publish "puffs," free reading notices or paid "write-ups"; to keep his reading columns independent of advertising considerations, and to measure all news by this standard: "Is it real news?"
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If you have read the foregoing standards, there is not much left to be said, except to tell you that these principles are *present day realities* and not merely beautiful ideals for future attainment.

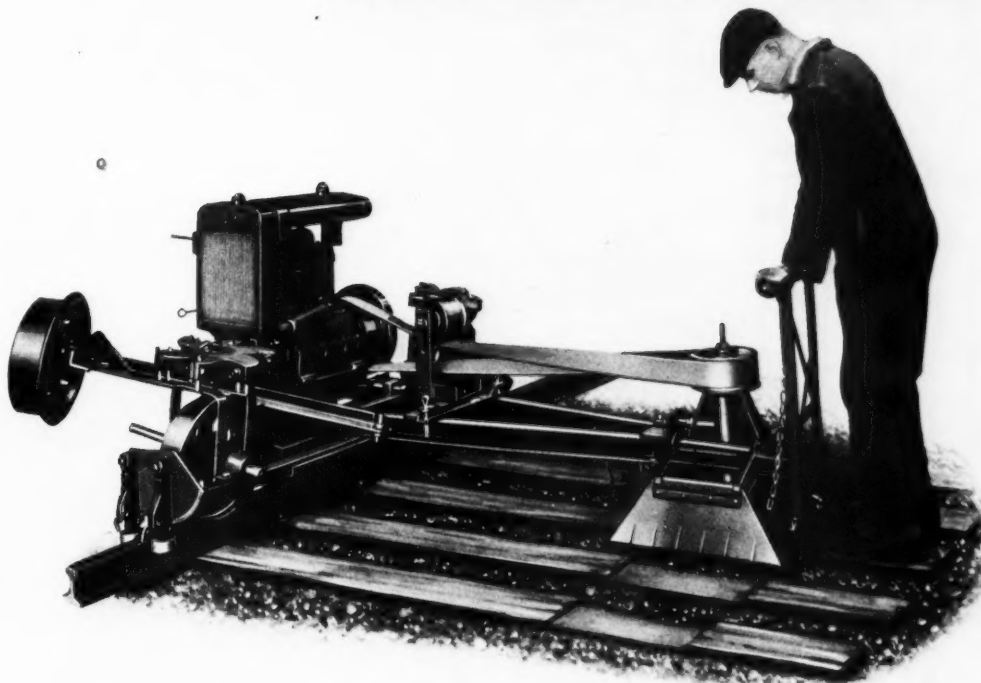
## THE ASSOCIATED BUSINESS PAPERS, INC.

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52 VANDERBILT AVENUE

NEW YORK CITY

# 8 TO 15 PERFECT TIE SEATS IN ONE MINUTE *ONE MAN DOES IT!*



No question as to uniformity of rail seats—every tie is adzed to exactly the same plane! Compare this with hand adzing where the plane of every tie seat is likely to be different.

Here is high speed, automatic accuracy which has hitherto been unknown in tie adzing.

Nordberg Power Adzer is fast supplanting the hand adzing gang. It takes the place of ten to twelve men, and by reason of the unvarying accuracy of its work, forestalls much future track maintenance expense.

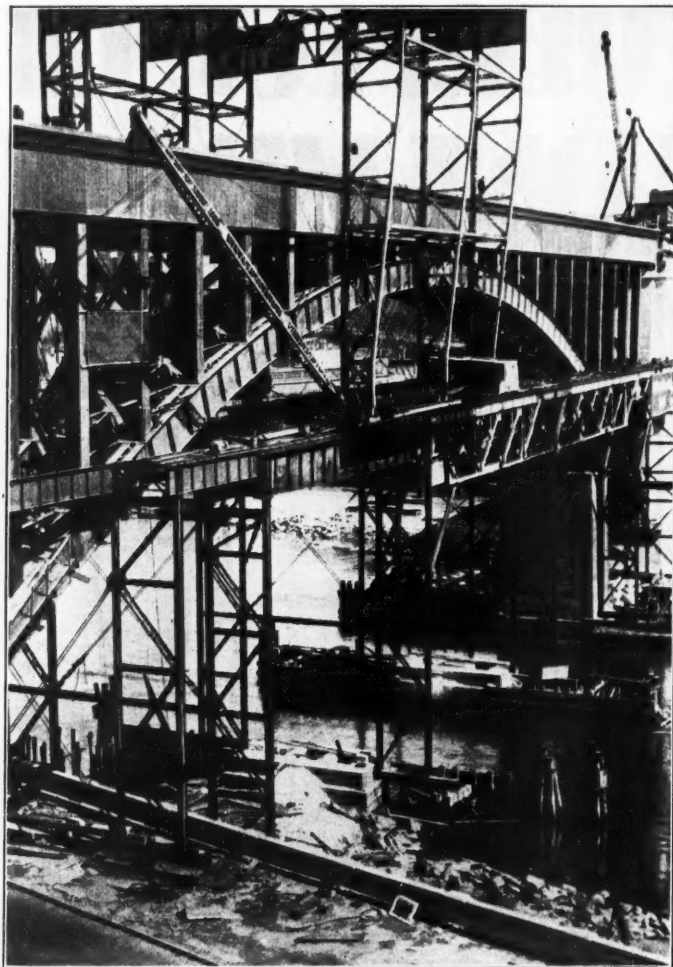
*Detailed data and information gladly  
sent on request*

**NORDBERG MANUFACTURING COMPANY**

MILWAUKEE, WISC.

LONDON, ENG.





## The Accepted Standard... Red-Lead Paint for Steel

**F**OR more than 100 years, pure red-lead has demonstrated its high efficiency as a protective paint for metal. It is the universal standard . . . the preferred paint for rust-proofing iron and steel.

A century of constant use has shown that pure red-lead paint gives a tough, rust-preventing film that is unexcelled in protective value—unsurpassed in length of life.

Fine, uniform, highly oxidized . . . there is no better red-lead obtainable than Dutch Boy red-

lead. It comes in two forms—paste and liquid. The liquid (ready for the brush) is supplied in six colors—natural orange-red, light and dark brown, light and dark green, and black. The paste comes in natural orange-red and can be shaded to dark colors.

### NATIONAL LEAD COMPANY

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Chicago, 900 West 18th Street / Cincinnati, 659  
Freeman Avenue / Cleveland, 820 West Superior  
Avenue / St. Louis, 722 Chestnut Street / San  
Francisco, 235 Montgomery Street / Boston,  
National - Boston Lead Co., 800 Albany Street /  
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Fourth Avenue / Philadelphia, John T. Lewis  
& Bros. Co., Widener Building.

### OTHER DUTCH BOY PRODUCTS

In addition to red-lead, the following products are sold under the Dutch Boy trademark: White-lead, linseed oil, flattening oil, solder, babbitt metal, lead pipe. The "Dutch Boy" guarantees high quality.

**DUTCH BOY**



**RED-LEAD**

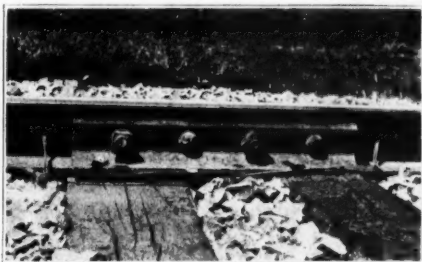
## Use the Improved Jordan Railway Track Oiler for Economical and Proper Application of Oil to Railway Track Structure



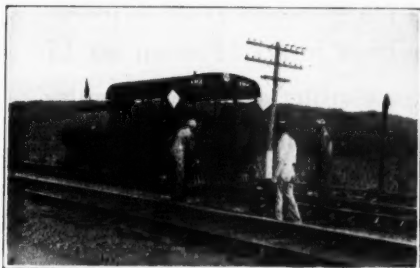
JORDAN RAILWAY TRACK OILER

Manufactured By

**O. F. JORDAN CO.**  
EAST CHICAGO INDIANA



AUTOMATICALLY OILS RAIL JOINTS AT A SPEED OF 8 MILES PER HOUR. JOINTS, BOLTS AND NUTS ARE THOROUGHLY COATED.



JORDAN RAILWAY TRACK OILERS ARE EQUIPPED WITH HAND-OPERATED SPRAYS FOR OILING SWITCHES, FROGS, INTERLOCKERS, ETC.



DRAWBAR PULL—VERY HIGH—ENABLES PULLING STANDARD TANK CARS FOR HEAVY OIL APPLICATIONS.

—Self-Propelled

—Ruggedly

Constructed

—Heavy Steel  
Wheels

—Roller Bearings

—Heavy Duty  
Mechanism

—Maximum Speed  
25 M. P. H.

—Straight and Auto-  
matic Air Brakes

—Economically  
Performs Every  
Railway Track  
Oiling Function



APPLIES PROTECTIVE COATING OF OIL TO ENTIRE RAIL AND FASTENINGS AT A SPEED OF 15 MILES AN HOUR USING 1 GALLON OF OIL A MILE FOR EACH POUND OF RAIL PER YARD.



APPLIES DUST-LAYING, WEED-KILLING COAT OF OIL OR OTHER COMPOUND TO ROAD-BED AT SPEED OF 6 to 8 M.P.H.



ELIMINATES USE OF LOCOMOTIVES ENTIRELY. PERFORMS OWN SWITCHING OPERATIONS WHEN NECESSARY.

*Now Successfully Operating on Many Leading Trunk Line Railways*

# Renew rail ends a mile at a time without pre-heating

## TELEWELD *electric* PROCESS

**ECONOMY  
and  
DURABILITY  
proven  
by 17  
prominent  
railroads  
representing  
over  
75,000 miles  
of road**

*Teleweld* is the modern, electric process for renewing rail ends. It reduces maintenance cost. It covers a mile at a time. It saves pre-heating. It operates without removing rails and without interrupting traffic. Perfected over a period of six years in building up nearly half a million joints. Proven on 17 prominent Railroads representing over 75,000 miles of road extending from the Atlantic to the Pacific.

### **TELEWELD *complete* SERVICE**

*Teleweld* does all the work, provides all labor, supervision, and equipment, and accepts full responsibility. The service is complete. The Railroad makes no investment, pays a definite price for work done, and is fully protected by guarantee. A rail Survey by *Teleweld* Engineers may reveal some interesting facts on your road as it has on many others. No cost. No obligation. Write for complete information.

**Electric Railweld Service Corporation**  
**Railway Exchange Building — Chicago**

San Francisco - Spokane - Denver - Boise - Salt Lake City - Cleveland

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## For A Firm Road-Bed Control The Water

**S**UB-SURFACE water is a great road-bed disturber. It causes misalignment and uneven track. Wherever it is allowed to collect in open cuts, tunnels, sags, multiple track or track pans, a job is brewing for the maintenance gang.

Remove sub-surface water as quickly as you can and as economically as possible.

For drains of unusual efficiency and long life the choice of many railroads is Toncan Iron.

Toncan Iron drains have an added resistance to corrosion and erosion gained through the protective presence of copper and molybdenum. These elements give the naturally resistant iron still further protection against weathering and corrosion.

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The Berger Mfg. Co., of Mass.  
Boston, Mass.  
The Berger Manufacturing Co.  
Philadelphia, Pa.  
The Berger Manufacturing Co.  
Roanoke, Virginia

The Berger Manufacturing Co.  
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The Berger Manufacturing Co.  
Dallas, Texas  
The Berger Manufacturing Co.  
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The Berger Manufacturing Co.  
(Export), Canton, Ohio

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Tri-State Culvert Mfg. Co.  
Memphis, Tenn.

Tri-State Culvert Mfg. Co.  
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The Firman L. Carswell Mfg. Co.  
Kansas City, Kan.

Wheat Culvert Co., Inc.  
Newport, Ky.

Beall Pipe & Tank Corp.  
Portland, Ore.

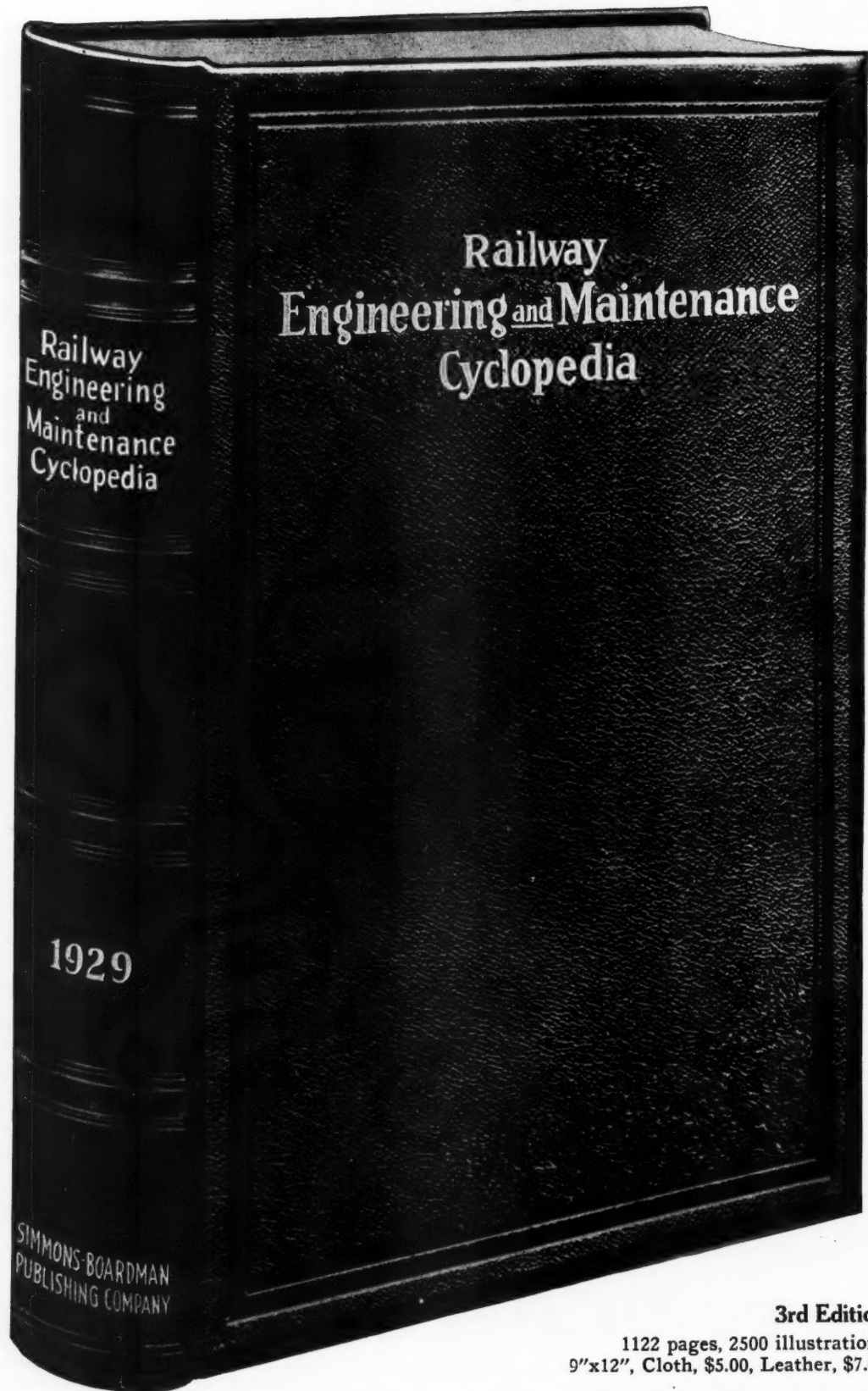
Superior Culvert & Flume Mfg. Co.  
Los Angeles, Calif.

Superior Culvert & Flume Mfg. Co.  
Oakland, Calif.

The Thompson Mfg. Co.  
Denver, Col.

# TONCAN COPPER MO-LYB-DEN-UM IRON

*Published July 22nd*



**3rd Edition**

1122 pages, 2500 illustrations  
9"x12", Cloth, \$5.00, Leather, \$7.00

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# Railway Engineering and Maintenance

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Dear Reader:  
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I often wonder how thoroughly you read Railway Engineering and Maintenance. I also wonder what benefit you derive from it. Every editor desires to know how closely his subscribers read his paper, for it is only through such information that he can be sure that he is meeting their needs.

To secure this information first hand, I overlook no opportunity to meet as many of our readers as possible. Among other measures I have made it a practice to drop in unannounced from time to time on a division engineer on whose territory our paper circulates freely and go with him from gang to gang, questioning the supervisors and the foremen to ascertain if they, as well as their superior officers, are reading the paper. Two experiences in the course of such trips have given me such definite evidence of the educational value of our publication that I want to tell you of them.

On one instance I found that the men were so thoroughly familiar with the contents of the various issues that they were prepared to debate the positions taken by the authors of the articles. Even more interesting to me was the fact that nearly two-thirds of these foremen had their copies of the current issue on their motor cars and were discussing the various articles with the men in their gangs during the noon hour.

On another road over which I was traveling with the division roadmaster we found the various foremen and supervisors equally well-informed. As we left one gang the roadmaster said to me, "If the next foreman tells you that he reads your paper, don't believe him, for he is a Japanese who doesn't read English." To our surprise, we found this foreman as familiar with the contents of the paper as his associates. We were puzzled at this and asked him how he knew what was in these articles when he was unable to read English. "Why, that's easy," he replied, "my daughter reads all these articles to me."

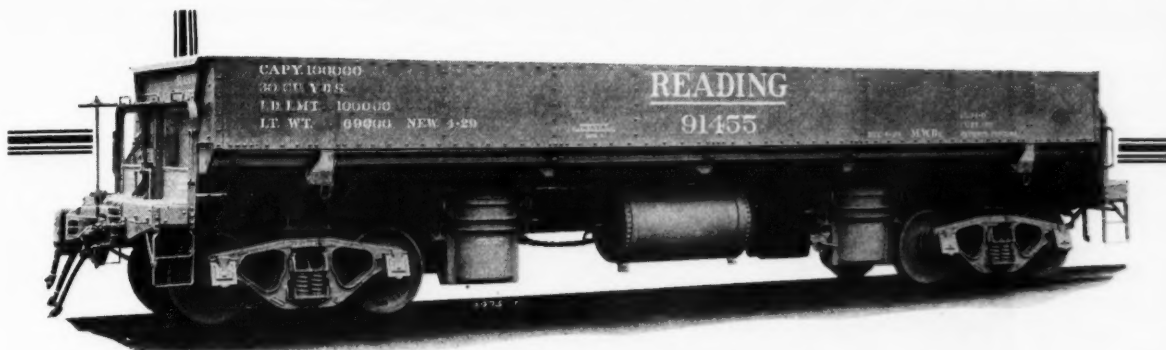
We confess to a certain feeling of pride when we find that articles prepared primarily to serve system and division maintenance officers are also being read with such active and critical interest by the foremen. Possibly similar instances have come to your attention that have demonstrated the value of the paper to you and to your men. If so, I will be glad to hear of them.

Yours truly,

*Elmer J. Howson*  
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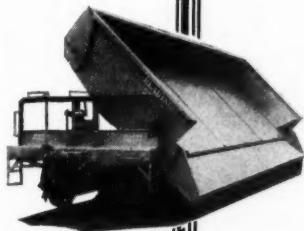
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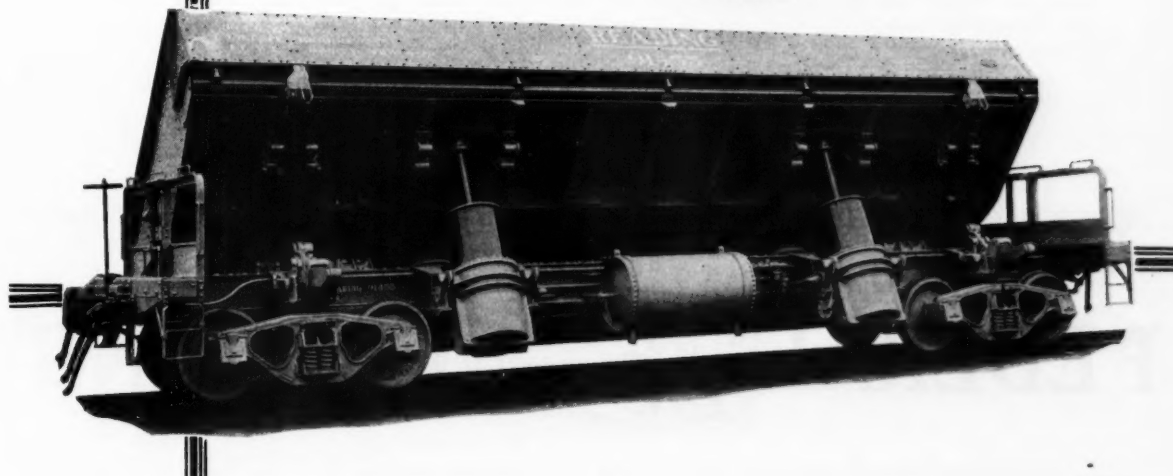
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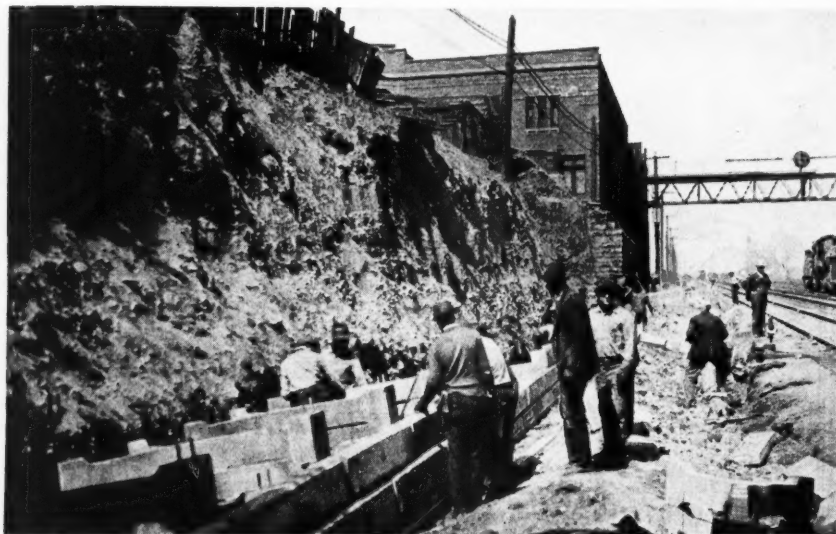
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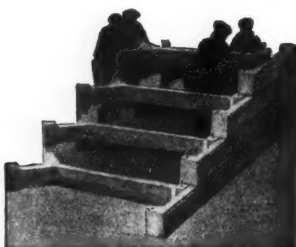
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# Railway Engineering and Maintenance

Volume 25

August, 1929

No. 8

## The Value of Good Water

**T**HIS IS the time of year when surface supplies of water for locomotive use begin to run low, with the result that such waters containing encrusting solids increase their hardness, while marked fluctuations in both hardness and suspended matter may occur locally as a result of sudden summer showers. In some districts where the water is secured from streams or springs, the tendency of the water to foam, when introduced into the locomotive, is also increased to the point where engine failures can be avoided only by the closest attention from the water service department. In many sections of the country, these conditions are quite likely to continue in more or less aggravated form for the next two or three months and in some places for a longer period.

This, then, is the season when valuable data can be secured, upon which to base future recommendations for changing the source from which the water is obtained; for securing additional water from other sources, where the present supply does not give a sufficient margin of safety; or for installing water treating systems with or without filters, either at isolated plants or as a co-ordinated plan over an extended territory.

It can not be repeated too often or emphasized too strongly that the delivery of clean soft water, free from encrusting solids, corrosive elements, or a tendency to foam is a matter of the greatest importance, whether viewed from the standpoint of locomotive maintenance or good operation. Engine failures bring with them a train of evils which include greater costs, delay to traffic, disorganization of what should be a smooth-running traffic operation, and a decrease in the utilization of expensive locomotive equipment.

When engine failures are caused by the poor quality of the water which they must use or, even though failures do not occur, if the cost of locomotive maintenance runs too high or locomotive operation is lowered in efficiency, surprisingly large returns can be secured from an investment in water treating equipment. The American Railway Engineering Association is authority for the statement that "few natural waters are so good that some form of treatment does not improve them."

Since only about 13 per cent of the total amount of

the railway water supply that should be treated, is now being treated, the remaining 87 per cent constitutes a wide field for the introduction of economies in both cost of locomotive maintenance and the moving of traffic.

## Large Roadway Expenditures

**I**N THE FIRST five months of this year the Class I railroads of the United States spent \$333,896,779 for maintenance of way and structures, an amount which has been exceeded only once in that period in history. Furthermore, the amount expended in the month of May was less than one half of one per cent below that of the same month in the record year, 1927. This year started with maintenance of way expenditures running below those of last year and even further below those of 1927. In March, however, this condition was reversed and since that time the expenditures have steadily exceeded those of a year ago and are now practically on the level of the record year. With the steadily increasing toll that the present heavy traffic is taking of the track and structures and the still more favorable net earnings of the roads, it is to be expected that this trend toward heavier expenditures will continue and that the total for the year will exceed that of 1927 and establish a new high record.

Capital expenditures are likewise showing a tendency to increase. In a recent compilation, the Bureau of Railway Economics found that roadway expenditures

for the first three months of the year were \$5,935,000 below those for the corresponding period of 1928. In this period, however, additional expenditures for roadway improvements aggregating \$225,547,000 were authorized, with the result that the carryover of unexpended authorizations was increased from \$293,289,000 on December 31, 1928, to \$429,359,000 on March 31, 1929. Since that time improvements have been authorized on an even more liberal basis than in the opening months of the year and the Bureau estimates that capital expenditures for all purposes (roadway and equipment) will exceed \$770,000,000 in 1929 or nearly \$100,000,000 in excess of those last year.

With maintenance and improvement programs of such magnitude confronting them, roadway officers face

### The Railways

1. Furnish work and a means of livelihood to one and three-quarters million employees.
2. Pay out nearly three billions of dollars in wages annually, which find their way almost at once into the channels of trade and commerce.
3. Give indirect employment to many hundred thousand additional men, who manufacture and distribute the products bought and used by railways in construction, maintenance, and operation.
4. Expend more than a billion and a quarter dollars per year for the materials and supplies utilized in their operations.
5. Spend an annual average of more than three-quarters of a billion dollars for capital improvements.

the necessity of utilizing every opportunity to push each project with the utmost rapidity during the next few weeks in order that they may not be caught with a large amount of unfinished work to be completed under the handicap of adverse weather later in the fall.

### A Hot Weather Suggestion

**T**HE OLDER types of coal-burning stoves are still used in many passenger stations and in some of the older office buildings, freight houses, engine houses and small shops. At best, they are inefficient in the use of fuel, while the amount and intensity of the heat they emit fluctuates over a wide range and is unevenly distributed. In addition, they are dirty and create a considerable fire risk.

This is the season of the year when steps must be taken to put heating equipment and ventilating systems in good shape for the coming winter. This being so, it should also be made a convenient time for the division maintenance and operating officers to make a comprehensive survey of the existing equipment and facilities for heating the buildings under their jurisdiction, with a view to formulating recommendations, preparing estimates and collecting supporting data to submit to the management with the budget for next year, showing selected points where economies can be effected by the installation of new heating equipment.

There are several recent designs of stoves and small heating plants suitable for unimportant stations, which have demonstrated marked economies over the older type of stoves, besides being cleaner and reducing the fire hazard. Likewise, there are available heating units of larger capacity for the larger or more important buildings. Such a survey as is suggested should disclose enough places where economies can be effected to make it well worth while.

### Keeping Ahead of the Designer

**T**HE FACT that concrete has much less strength than steel, per pound of material used, has imposed limitations on the use of the reinforced concrete slab or girder as a substitute for the steel span in railway bridges. Owing to the greater weight of material required, the dead load of the bridge itself becomes such a large part of the total load to be carried that in spans of much over 50 ft. the design becomes an unwieldy one. In fact, the designer of some concrete girders used in two structures built by the Lackawanna is of the opinion that their length (about sixty feet, clear span) is substantially the limit in so far as practical designs are concerned unless resort is had to concrete mixes of greater strength or to aggregates that will produce lighter concrete.

The weight of concrete in proportion to the span length, as compared with steel, is of definite concern to the builder as well as the designer. Because of limitations in falsework that are too well understood to require explanation here, slab spans for a line already in operation, can rarely be built in place, and the choice is offered of setting them with car-mounted hoisting equipment or of rolling them in from a position to one side of the track. The first alternative imposes the limitation of the capacity of the derrick car or crane and so far as we know, slabs 35 ft. long in units 8 ft. wide weighing 92 tons, erected by the Pennsylvania near Clairton, Pa., about two years ago, are the heaviest ever handled in this way. With the other method, that of rolling, there is no limit on weight other than that of

the reasonable expenditure for the falsework necessary to support the concrete span while it is being built and later moved into place, and for necessary refinements in hauling equipment to insure that after the move has once been started it will be completed without a breakdown or extraordinary delay.

The rolling method has been in use for many years and it is clearly evident that it can be readily applied to any single-span slabs within the limits of practical design. Its application is primarily a matter of applying skill, ingenuity and experience to the problem at hand, but there is gradually being developed a technique comparable to the commonly accepted practices of steel erection. It is with the thought of adding to this knowledge that we present, on page 341, a description of the methods employed by the Seaboard Air Line in erecting the slabs of grade separation structures. The methods are the more worthy of consideration because of the weights handled, slabs weighing as much as 240 tons having been rolled into place.

### Horse Shoe Curve

**A**MONG travelers throughout the world, the Horse Shoe curve on the main line of the Pennsylvania is known as a point of rare scenic beauty. To the track man, however, it represents the maximum in difficult track maintenance. For twelve miles this four track line ascends the eastern slope of the Allegheny mountains on a practically continuous grade of 1.75 per cent and with 58 per cent of the line on curves of an average of  $4\frac{1}{2}$  deg. and a maximum of  $9\frac{1}{4}$  deg. These tracks must be maintained to carry a traffic averaging more than 250 trains daily.

Such a combination of physical handicaps, traffic density and high maintenance standards is probably without parallel in this country, and, in fact, in the world and the methods employed are of necessity born of the severity of the conditions. Yet, by reason of the very acuteness of this problem, there is much in these methods that warrants study by those whose problems are less difficult. It is for this reason that we present a somewhat detailed account, on page 331, of the methods followed in the maintenance of this portion of line. We know that the unique conditions that prevail here will result in this article being read by every one who comes in possession of this publication.

### Team Work in Ordering Materials

**I**N SUPPLYING materials, the ideal situation exists when the stores department knows just when these materials will be needed so that they can be furnished promptly without being held in stock for long periods of time. Under normal conditions, the requirements for ordinary maintenance can be anticipated within reasonably close limits and the same can be said of materials required for new work when the programs for additions and betterments are made in advance to outline both the amount of work and the time it will be done with a fair degree of accuracy.

Indicative of what can be done in effecting true economies in the amount of stock carried by the stores department is a summary compiled by the Railway Age, referred to on page 348 of this issue, showing that the Class I railways on December 31, 1928, had reduced the value of their stocks of materials and supplies to a point \$53,291,000 below their value at the end of 1927. This is an important saving, since it released that amount of capital for use in constructive undertakings,

and it is fair to assume that the maintenance of way department, by its co-operation with the stores department, is entitled to a share of the credit for this result. That the maintenance department is alive to the importance of this co-operation is evidenced by the attention which has been devoted to various phases of this subject by the Roadmasters' and Maintenance of Way Association and the American Railway Bridge and Building Association at their conventions during the last several years.

Emergencies may necessitate abrupt changes in pre-arranged programs, or changing conditions may make it advisable at times to vary the order of the program. Such changes must be made on their necessities or merits, but the cost of carrying materials which may have been delivered to the work is one of the elements to consider when programs are revised other than from necessity, although, in some instances, it receives but scant attention.

### Modernizing Passenger Stations

ONE outstanding difference between American and European cities to which attention is frequently directed is the far greater proportion of new buildings here, a proportion that cannot be explained solely by their relatively faster growth but must be ascribed in large part to the policy of tearing down old structures and replacing them with new ones. There are many reasons for this. In a new, rapidly growing country where building materials are relatively cheap, people build more quickly and not so well, while styles in building architecture change more rapidly and often run to the freakish with the result that many buildings soon become shabby or unattractive. In more recent years, also, the rapid development of new building materials, and improvements in plumbing, heating and lighting, together with an unprecedented increase in the wealth of the American people, have made it possible to discard old buildings for far better ones. This movement has not been confined to any one class of structures, but includes dwellings, stores, shops and public buildings, and has also given rise to a demand on the part of the public for new railway passenger stations, not because the old ones are too small, but because they are old fashioned.

Within the last few years there has been some evidence of a change of attitude toward old buildings, especially in single-family dwellings. With increases in the cost of both labor and materials, home owners have become less inclined to assume the loss which must be incurred in disposing of an old house in order to acquire a new one. Furthermore, manufacturers of modern building accessories have become alert to point out how a home may be remodeled to bring it up to date; in other words, how it may be made the equivalent of a new building.

That this practice is applicable to railway passenger stations of moderate size as well as to homes and other buildings, is indicated by the work done by the Chicago, Burlington & Quincy, which road, as described on page 335, has converted a number of "old fashioned" stations into the equivalent of new ones at small expense, compared with the cost of entirely new structures. Modernization, as the term is used in this connection, embraces many things, all of which need not necessarily be applied to any given structure. In general, it may be said to cover whatever is required to satisfy the demands of efficient use, comfort, cleanliness, sanitation, economy in maintenance and appearance.

With the decline in local passenger service, few sta-

tions in towns of medium size are now too small, but they may require alterations to effect greater convenience or efficiency in operation. The requirements of comfort, cleanliness and sanitation are closely allied, and are fulfilled by installing better lighting and heating and up to date plumbing, and by making such changes in the floors and interior walls as will make for greater cleanliness and reduce the cost of maintenance. Alterations made for such purposes, if carried out with taste, and if they include such changes of the exterior as are necessary to eliminate the shabbiness that comes from hard use, will often fulfill all needs, in so far as appearance is concerned. Whether more than this is necessary depends largely upon the architectural style of the building.

The mere fact that the structure is old offers no legitimate ground for a change in style. The colonial style of the east or the Spanish mission in the southwest, when used in their natural environment, cannot be improved upon. It is the square box with an overhanging lid or the "castle" of the scroll-saw period which needs attention. In general, simplification of detail rather than elaboration will make for more satisfactory appearance; in other words, what is needed is the exercise of good taste in carrying out such changes as are required to make the structure more attractive in every way for those who must use it. This is a subject well worthy of study by those who have to do with railway buildings.

### Watch the Delays

AT THIS season of the year when maintenance and improvement work is at its height and every ounce of energy is being directed to its prosecution, it is of more than usual importance that each unit of work equipment be kept constantly in service. Yet a survey of the performance of this equipment on the average road during the last month will show that much of this equipment was idle for one cause or another during a not insignificant portion of the time.

This condition is not appreciated on the average road and for this reason it is pertinent to suggest that a survey of these delays be made at this time while conditions are fresh in mind, in order that they may be detected and the necessary measures taken to eliminate their repetition. Such a survey will bring to light a wide variety of causes for idle time, such as failure to anticipate and to receive needed repair parts, negligence in the provision of fuel, lack of co-ordination between adjacent territories when transferring a unit from one division to another, etc. These are indicative of many conditions which occur from day to day and which result in equipment being idle at a time when it can least be spared.

In view of the investment in the many machines now employed in maintenance and particularly because of the savings which it is possible to effect by its continued use, it is essential that such equipment be kept constructively employed. To do this requires supervision of a character not ordinarily possible from local division officers whose attention must, of necessity, be divided among many demands. Rather, the amount of work equipment now in use on the average road warrants the undivided attention of one person who can be held responsible for the elimination of all possible delays.

This is the season of the year when shortcomings in the performance of equipment can be detected most readily. For this reason, maintenance officers can now well check the equipment under their supervision to see if it is doing all that may reasonably be expected of it.



*A Tile Bunkhouse on the Southern Pacific at Mecca, Cal.*

# Housing on the Southern

**A**MONG the large railways which provide living quarters for a considerable percentage of their maintenance of way forces is the Southern Pacific, which, in its early history, was forced to do this as a matter of necessity, and has continued the practice, not so much from necessity as from the realization that by so doing it has been able to build up a loyal, contented force of workers. The Pacific Lines of this system traverse desert regions in the Southwest as well as other thinly settled areas in the West and Northwest, while the character of the traffic demands well-maintained track, for which competent foremen are necessary. As a consequence, considerable attention has been paid to housing the maintenance forces in a comfortable manner and the present facilities, which represent progressive improvement, are the result of an evolution which, among other changes, has marked the almost complete disappearance of the "boomer" type of foreman.

The Southern Pacific had its beginning in the Central Pacific which was completed between Ogden, Utah, and Sacramento, Cal., in 1869, through a country which was almost devoid of white settlers. For this reason, it was necessary to construct or otherwise provide living quarters for those of its employees whose assignments were subject to change of location and, with the expansion of the system, usually through regions which were not well developed, the practice was continued until it has become the settled policy of that road to furnish such facilities for its maintenance of way forces where suitable living quarters cannot be obtained at a reasonable cost.

From the nature of his work, the section foreman cannot be expected to provide his own living quarters except in communities where he can rent a suitable house convenient to his work at a reasonable price or where, if he should prefer to own his own home, he can find a ready sale for it at a figure which

will protect him from loss. Aside from the fact that section headquarters must often be located at isolated points, the foreman can seldom feel that he will remain for a definite period on the section to which he is assigned, since promotion may compel him to move or the exercise of his seniority rights or the desire to obtain better school facilities for his children or other advantages for himself and his family, may make a change of location desirable. Recognizing these conditions, the railway has made it a practice

## A CONSISTENT POLICY

This article, the fourth of a series treating of the housing of maintenance of way employees, outlines the work of the Southern Pacific in providing living quarters for its section foremen. This system, forced by necessity to provide these facilities in its early existence, has continued to furnish them from a realization of the benefits gained by the practice in building up a loyal, contented organization of workers. As the result of a consistent policy in this respect, constant improvements have been made in these quarters, not only with regard to modern conveniences, but also in the adaptation of the architecture to the climatic conditions which prevail on various parts of the system.

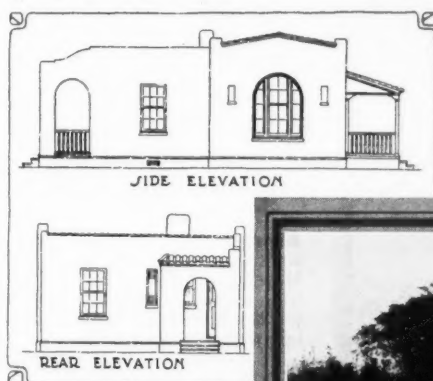
*Both grand divisions  
of this system show  
steady progress in  
providing suitable  
quarters for their  
maintenance men*

# n Pacific

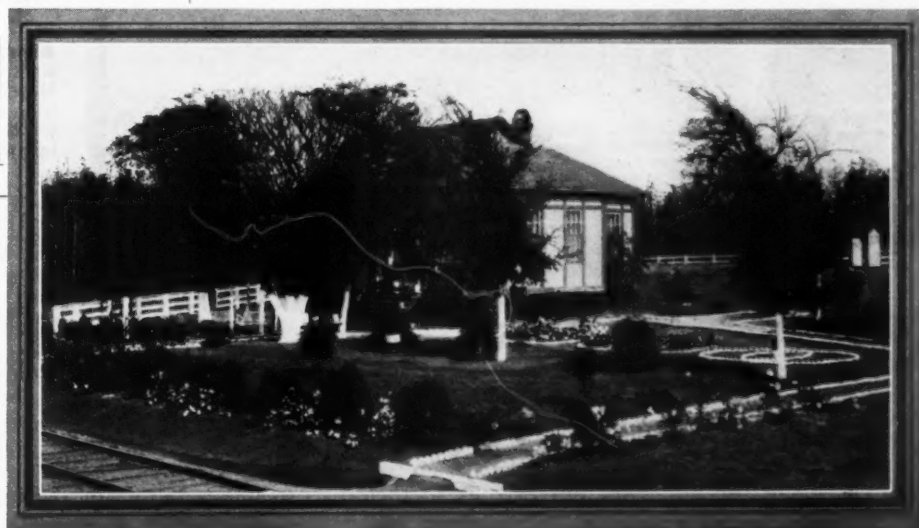
not only to provide comfortable dwellings rent-free at outlying points, but also to furnish fuel and water without charge.

## Climatic Conditions Are Taken Into Account

Traversing, as it does, the region from Portland, Ore., to Southern California, and thence easterly through Arizona and New Mexico, the Pacific Lines of the Southern Pacific pass through regions of wide-



Above—Exterior views of the new standard type of dwelling adopted for southern territory. At the right—The section foreman's house and yard at Mahl, Tex.



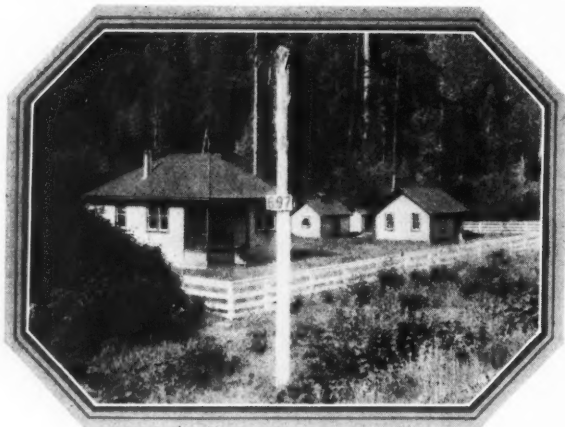
ly differing climatic characteristics, and in the design of its living quarters these characteristics have been taken into account. Except for special designs, which are finished in colors to harmonize with the type of architecture, the houses are built to standard plans and are painted standard colors. These standards have, of course, changed from time to time so that a variety of designs are found in the existing buildings.

During the last few years considerable study has been given to the revision of the housing standards, and plans for section dwellings have been adopted which combine more modern conveniences than were found in the older structures, with a more pleasing exterior than formerly. The guiding thought in these designs has been to bring the plans up to date in both design and facilities and to include those comforts which the occupants of the older buildings have shown, by their efforts at remodeling, were most desired. As a result of these studies, two standard types of construction have been adopted recently, that for the southern territory being of the Mediterranean or Italian type, while the design for the northern territory is of the Colonial type.

## Modern Conveniences Are Provided

In both of these designs, ample porches have been provided to permit the family to sit out of doors. The bedrooms have been made larger than in the older houses to accommodate two beds each, with the usual furniture, and each has a good-sized closet. A modern bathroom, convenient of access from all the living rooms, contains a tub, lavatory and toilet. The kitchen is of good size and contains a cabinet, a cooler, a sink with a drain board and a 30-gal. water heater. Access is provided to all of the rooms without passing through the kitchen, and in planning the interior consideration was given to the placing of the furniture and the location of the doors and windows to afford maximum light and ventilation. The houses for the southern territory are finished in stucco and have flat roofs covered with built-up asbestos roofing, with an air space between the roof and the ceilings. The porch and parapet walls are covered with small Cordova tile.

Attention has been given to sanitation and where quarters are grouped, a highly-efficient type of septic



Section House at Swisshome, Ore.

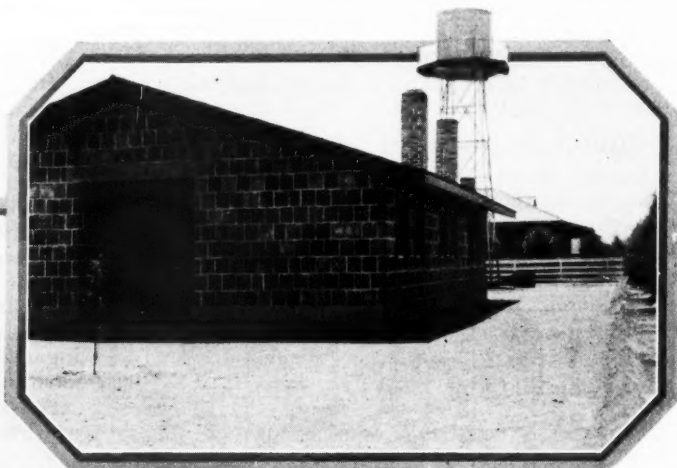
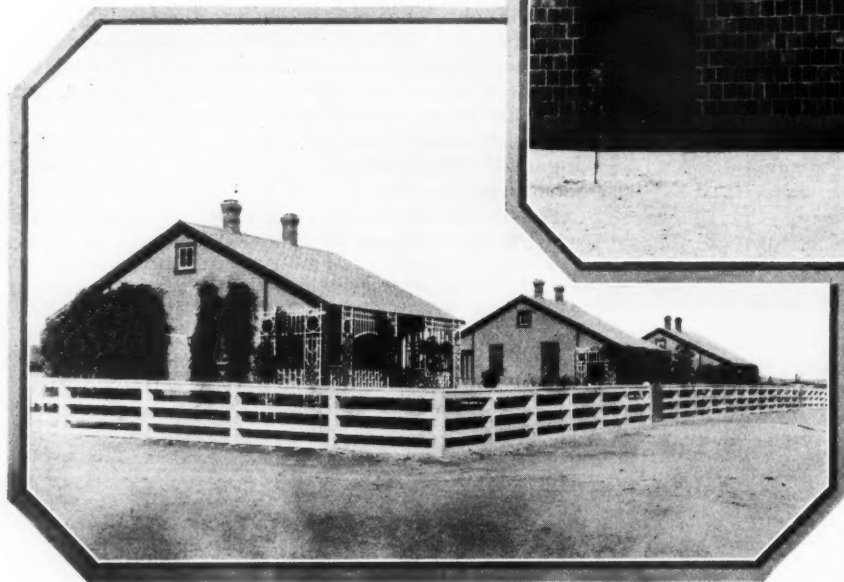
tank is installed, the effluent being disposed of through subsoil grids of drain tile. Water is supplied from nearby wells or streams of unquestionable character except in the desert areas where it is hauled in water cars from approved sources and stored in cisterns. During the last few years the eradication of bedbugs, cockroaches and other vermin has been placed under the direction of one man on each division, who is made responsible for the proper fumi-

trees, which are furnished free of charge. The front yard is enclosed with a neat wire fence and a tight board fence is erected in the rear to afford privacy and also as a protection to the vegetable garden.

#### Living Quarters for Section Laborers

Climatic conditions also affect the type of construction used for the section laborers on the Southern Pacific's western lines and this is further influenced by the class of labor employed. On the northern portions of the system, where native labor is used, neat quarters of frame construction are erected for this purpose wherever necessary. In the desert areas of the southern territory, where the labor employed is largely Mexican and where the men will remain more steadily if they can have their families with them, the construction is changed, not only to afford better protection from the heat, but also to take into account the racial preferences of the occupants in the arrangements of their quarters. These structures are built to house several families and are constructed of hollow tile, brick or concrete, with asbestos shingle roofs. Running water is supplied to the kitchens. A corridor, running lengthwise of the building, provides entrance to the various quarters and also furnishes a cool place where the women of the families like to sit and sew. These quarters for the laborers, over the entire line, are built adjacent to the quarters for the foremen and the grounds are

Below—Attractive houses provided in the desert for two section foremen and the agent at Langtry, Tex.



Above—The quarters for the section force at Harqua, Ariz., a typical tile building designed for the use of Mexican laborers and their families

gation of all the railway dwellings and outfit cars and who is also charged with making sanitary inspections and seeing that all quarters are screened against flies.

The care taken to provide comforts for the maintenance forces does not stop with the design and construction of the buildings, but extends to their surroundings. To this end, the railway encourages its employees to set out flowers, vines and shade

required to be kept in good condition. In the desert regions, Arizona ash and other trees adapted to the climate are set out as shade trees, water for their cultivation being supplied with that for household purposes.

W. H. Kirkbride, engineer maintenance of way and structures of the Pacific Lines of the Southern Pacific, to whom we are indebted for the foregoing information, expresses himself as follows on the result of

these efforts which have been made for the employees:

"The time and money spent in providing living conditions which make the employees more comfortable and hence more contented, and which encourage the women of the families to take pride in their gardens and housekeeping, have proved well worth while in the reduction of the labor turnover and in the development of more reliable and efficient forces which have resulted. In warm climates the women soon become restless if the living quarters do not have verandas and shade trees which allow them to sit out of doors."

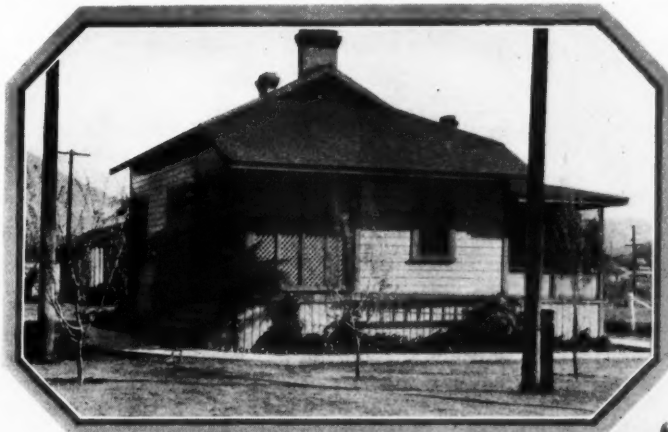
#### Housing on the Lines in Texas and Louisiana

The general policy of the S. P. Lines in Texas and Louisiana is similar to that of the Pacific lines, in that it provides living quarters for the section foremen at outlying points and in the smaller towns and communities where it is difficult to rent satisfactory houses. Similar accommodations are provided for signal maintainers at many locations. These quarters, as well as those for the section laborers, are furnished without any charge for rent.

These quarters are built to standard plans and are painted in standard colors. In recent years, the railway has added bathrooms wherever a water supply is

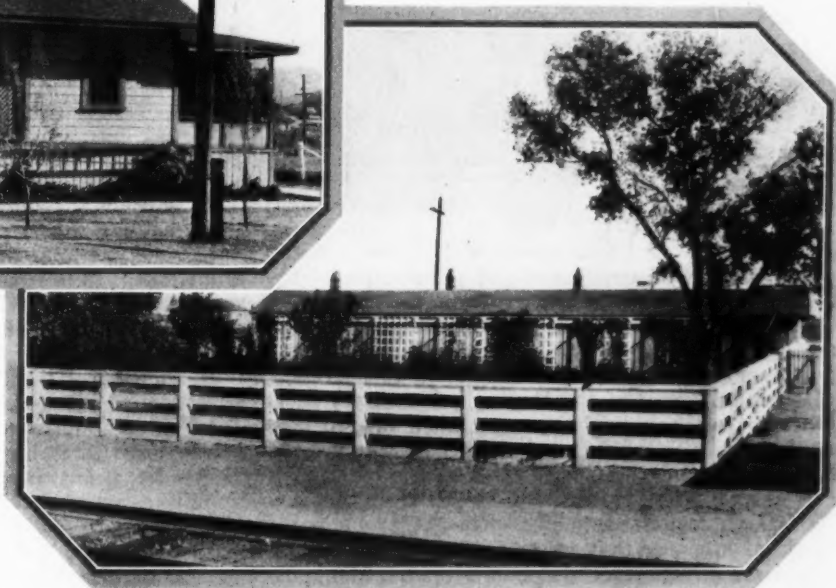
ers to beautify the surroundings of the homes is evidenced by the accompanying illustrations of employees' living quarters at Marathon, Tex., and Langtry, where the average annual precipitation amounts to only about six or seven inches.

On these lines an inspection train is run over the entire system each fall for the purpose of examining the condition of the physical property. Cash prizes are awarded the foremen having the best-maintained sections on each roadmaster's district, based on comparative scores kept by members of the inspection party. In these scores, account is taken not only of the maintenance of the track, road-bed and right-of-way, but also of the stations, section foremen's dwellings and laborers' bunkhouses. The inspection of these latter facilities covering the interiors as well as the grounds surrounding the buildings. A perfectly maintained section-quarters layout counts for 10 per cent in the scoring, and since the award of prizes is frequently influenced largely by the excellence with which the living quarters are maintained, their care forms an inducement,



Above—A dwelling formerly occupied by the roadmaster at Hornbrook, Cal.

Below—The laborers' quarters at Marathon, Tex., are surrounded by a garden



available and at the present time a majority of the dwellings for the foremen are provided with these facilities.

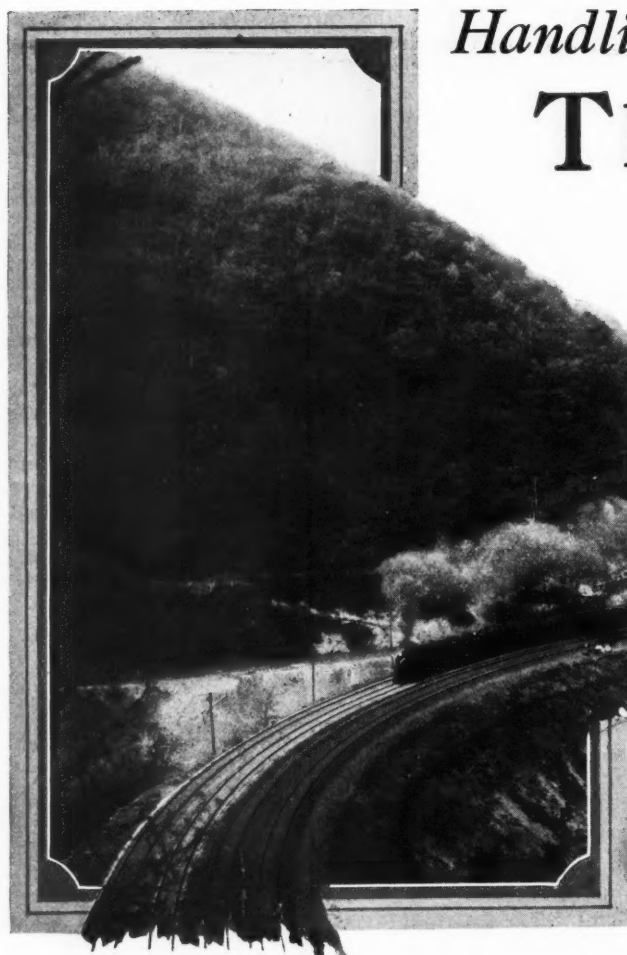
This railway takes special pride in the appearance of the dwellings and premises which it provides for its employees and encourages the occupants to keep them in presentable condition. As an aid to this co-operation, shade trees and fruit trees are furnished by the railway and planted on the grounds, and, wherever possible, water is supplied for the trees, lawns, flowers and gardens. As on the Pacific lines, climatic conditions vary widely on different portions of the lines, ranging from the warm, humid atmosphere of Louisiana and Eastern Texas, where vegetation grows with almost tropical luxuriance, to the arid areas of Western Texas. That lack of rainfall need not preclude the growing of trees and flow-

aside from other considerations, for the foremen to keep their houses in first-class condition.

E. A. Craft, engineer maintenance of way of the Southern Pacific Lines in Texas and Louisiana, who supplied the information on which the foregoing is based, testifies to the efficacy of these efforts to improve the living conditions of the maintenance of way employees, as follows:

"As a result of providing comfortable quarters for our section foremen, we are able to get and keep a better class of workmen than would otherwise be possible. As a rule, our company dwellings are the nicest houses and the best appearing properties in the small towns and communities where they are located.

"By providing suitable quarters where the Mexican laborers can live with their families, we are able to reduce the labor turnover materially. If these men are satisfied with the facilities furnished them, they will remain longer in the service and perform more and better work than they would if they were not interested in holding their jobs."



*Handling*

# The Country's Track

Double-Heading Up the 1.75 Per Cent Grade

ONE OF the most noted and picturesque pieces of railroad in the country from the standpoint of the traveling public, and equally noted among railway men because of the problems of transportation and track maintenance which it involves, is the four-track line of the Pennsylvania on the eastern slope of the Allegheny mountains, and, in particular, that part of this line comprising the famous "Horse Shoe" curve. This 12 miles of line, which carries as high as 71,000,000 tons of freight and 20,000,000 passengers annually, presents problems of track maintenance that are more exacting than those found on any part of the Pennsylvania, and, possibly, on any other railroad in the country.

## Frequent Renewals Required

On the Horse Shoe curve, which presents the most serious problems, the rails last only one year in some tracks; ties are destroyed in from three to ten years; the transposing and regaging of rails are necessary every 3½ to 4 months; resurfacing and relining out of face are necessary every year, and it is necessary to clean the ballast in certain tracks as often as every three months in order to provide adequate drainage. These are only indications of the intensity of the maintenance problems on this heavy-traffic mountain line, which extend continuously throughout the year, including the winter months when a large part of the time of the track forces is consumed in clearing the road of snow and sleet.

The eastern ascent of the Pennsylvania's crossing over the Alleghenies begins at Altoona, Pa., with an elevation of 1,178 ft. above sea level, and extends for about 12 miles westward to the summit at Gallitzin, Pa., which is 2,193 ft. above sea level; a rise of 1,015 ft. In this territory, 58.2 per cent of the line is on curves ranging from 1 deg. to 9 deg. 15 min., and with an average curvature of 4 deg. 30 min. The grade up the eastern slope is uniformly 1.75 per cent, compensated for curvature.

In the face of these adverse operating conditions, this section of track carries the Pennsylvania's through east and west passenger and freight traffic, which has run as high as 165 freight trains and 92 passenger trains in a 24-hour period. Under the conditions which have prevailed during the last few years, an average of approximately 7,000 freight cars pass over these tracks daily, and the number has run as high as 10,066 cars. These cars are run in trains of 105 to 110 cars, and are assisted up the mountain by either one or two pusher engines. From 18 to 20 of these helper engines are in constant service on the mountain, or are held in reserve at Altoona. They are operated by a separate pool of 43 crews, each of which makes approximately two trips from Altoona to Gallitzin and return in an eight-hour day.

## Assignment of Tracks on the Curve

All of this traffic of necessity passes around the Horse Shoe curve. This curve, which is about one-third of the way up the slope, closely resembles a horse shoe in shape, and consists of a main curve forming the body of the shoe, with a short tangent and a reverse curve at each end which form its sides and calks. From the standpoint of the trackman, however, the Horse Shoe curve means the

# Most Difficult Maintenance

*Sharp curvature, heavy grades and dense traffic impose many problems on the Pennsylvania's famous Horse Shoe Curve*



Fighting Heavy Snows on the Curve Is the Major Problem of the Winter Months

main body of the curve, which gives by far the most trouble and concern. This section is about 2,500 ft. in length, and is made up of a 9-deg. 15-min. curve on the west half, and an 8-deg. 30-min. curve on the east half. The distance across the deep gap which forms the heart of this compound curve, measured between points 1,200 ft. each side of the toe of the Horse Shoe, is approximately 1,000 ft., and between these points there is a difference of elevation of about 40 ft.

The four tracks on this curve are numbered 1, 2, 3 and 4, in order from the innermost track. Track 1 is used for eastbound freight traffic, Track 2 for eastbound passenger traffic, Track 3 for westbound passenger traffic, and Track 4 for westbound freight traffic. While this assignment of tracks is varied at times in order to facilitate the movement of trains, and not infrequently because of mishaps and the presence of work trains on the curve, the preponderance of all westbound or uphill traffic is confined to Tracks 3 and 4, while most of the downhill traffic is confined to Tracks 1 and 2. These latter two tracks carry by far the larger percentage of loads, about one-half of which are coal.

In order to withstand the severe service in this territory, the Pennsylvania's heavier type of track

construction is provided. This consists of 130-lb., 39-ft. open-hearth, high-carbon steel rails of P. S. section, with 6-hole, 38½-in. angle bars forming three-tie supported Joints, 22 No. 4 and No. 5 white oak ties to the panel, and 7½-in. by 14-in. heavy-duty, double-shoulder tie plates for each tie. Throughout the length of the Horse Shoe, and in fact, on other severe curves in the mountain district, the rail is secured to the ties by double spiking on the inside and single spiking on the outside of the rail. This is in addition to two anchor spikes, one on each side of the rail, used solely to hold the tie plate securely to the ties. All of the spikes are of the usual cut type, seven inches long.

Normally, eight rail anchors are applied to each rail length on the downhill tracks and six anchors to each rail length on the uphill tracks. At the lower end of the curve on the uphill tracks, however, where there is a tendency for excessive creeping of the high rails, there are eight anchors to the rail length. At these points also, it has been necessary to apply additional anchors to hold the rail of the uphill tracks from creeping down hill.

Stone ballast is used on all four tracks, the ballast section having a depth of from 24 to 36 in. under the ties. In the downhill tracks, Nos. 1 and



The Picturesque Horse Shoe Curve Is a Continuous Maintenance Problem

2, stone passing a 2½-in. ring and retained on a 2-in. ring is used, while on the uphill tracks, Nos. 3 and 4, which are subject to an unusually heavy deposit of cinders from locomotives working up the hill, the stone used is considerably smaller, and of a size capable of passing through a 1¼-in. ring, but retained on a ¾-in. ring. With this smaller size stone, which is called "mountain" ballast, a much larger percentage of the cinders deposited on the track is retained on the surface than would be the case with the larger stone and its larger voids.

#### Rail Life Ranges from One to Four Years

In spite of this heavy construction, designed specifically to meet the special conditions encountered here, track maintenance is unusually heavy and the necessary renewal of track materials is extremely costly. An example of this is seen in the short rail life on the curve, which ranges only from about one to four years. By far the most severe wear takes place on the downhill freight track No. 1, where, in order to secure even a year's life without exceeding the maximum of one-inch side wear in the head, it is necessary to transpose the high and low rails so as to equalize the wear on both sides of their heads. This transposition of rails is done about 3½ to 4 months after it is laid new, at which time the wear is sufficient to necessitate regaging of the track otherwise. By transposing the rail at this time, regaging, with its added destruction of the ties, is precluded until a like amount of service is secured from the other side of the rail head. When both sides have been thus worn, which on track No. 1 occurs in about seven or eight months, one regaging makes it possible to obtain the additional service from the rail up to the allowable limit of wear. The life of rail in the other three tracks of the curve is somewhat longer; that in track No. 2 being from 18 to 20 months; that in track No. 3 about 2½ years; and that in track No. 4 about 3 years. Regaging of all of these tracks is necessary about twice a year.

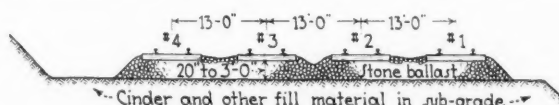
All rail on the Horse Shoe curve is laid without cant, and owing to the limitation of the speed of trains on the curve to a maximum of 35 miles per hour, and the considerably slower movement of most trains up the grade, the superelevation provided in the outer rails is relatively light for a curve of 9 deg. 15 min. On track No. 1 the maximum superelevation is 3½ in.; on track No. 2, 4½ in.; and on track Nos. 3 and 4, 4 in. By holding down the superelevation, it is felt that rail wear is reduced materially on the low rail, and further, that there is less likelihood of the derailment of long, heavy freight trains. In a further effort to minimize excessive rail wear on the curve, the Pennsylvania is experimenting with various types of rail and flange lubricators, which hold forth promise of reducing wear materially.

#### Routine Maintenance Is Practically Continuous

The life of ties on the Horse Shoe curve is also short, in spite of the fact that only the best No. 4 and No. 5 white oak ties are used. These ties are inserted untreated because their service life is determined entirely by mechanical wear and the destruction brought about by frequent regaging and respiking. In track No. 1, which carries the heavy freight traffic eastward, the average life of the ties is about four years, while the average life of the ties in track No. 2, the eastbound down-grade passenger track, is

approximately six years. In the other two tracks, Nos. 3 and 4, the mechanical destruction of the ties is considerably slower, and the life of the ties in these tracks is about ten years.

And so it is with practically all of the units of the track structure on the Horse Shoe, the life is materially shortened by the severe wear and strain which is brought upon them. Prior to the adoption of the heavy-duty tie plates with double shoulders, the standard single-shoulder tie plates of the Pennsylvania wore thin near the shoulder, and on Tracks 1 and 2 had a life of only about four or five years. The life of spikes on the curve is also short, and on Tracks 1 and 2, those used for holding the rail are



Typical Section of the Track on the Horse Shoe Curve

serviceable for only about one year. When regaging, however, many of these worn spikes are used for fastening the tie plates to the ties.

Relining and resurfacing, and keeping the ballast clean, are also problems on the Horse Shoe. Relining and spot surfacing are almost continuous operations, particularly on Tracks 1 and 2. Once a year all four tracks are completely overhauled in this respect, at which time they are carefully corrected as to curvature by the string lining method, and as to surface by the setting of grade stakes.

#### Keeping Ballast Clean Is a Problem

Keeping the ballast clean is a task almost without end, particularly on the two uphill tracks which are subject to the direct discharge of cinders blown from locomotives working up the grade. The two downhill tracks, however, also require frequent attention, as is seen from the fact that as much as 35 to 40 bushels of foreign matter per rail length is removed yearly from the intertrack space between Tracks 1 and 2. While much of the refuse over these tracks is cinders, a large percentage of it is coal dirt dropped from the thousands of loaded coal cars moving eastward over the curve each day.

All of the ballast in these two tracks, which, as previously mentioned, is of the standard size used on the Pennsylvania, is cleaned thoroughly once a year. In addition to this annual cleaning, which is done in connection with track raising, tie renewals and resurfacing, the inside ballast shoulder of Track 1 is cleaned at two other times during the year to insure run-off from the roadbed.

In order to prevent complete fouling of the ballast in Tracks 3 and 4, these tracks are put up on the finer "Mountain" ballast. By using this smaller size stone, the rapid accumulation of cinders over the track is retained largely on the surface of the ballast and does not filter down into the roadbed. Thus, when removing the cinders from Tracks 3 and 4, the ballast is not disturbed except at the surface. This surface cleaning is done about every three months.

In addition to the major operations of maintenance already mentioned, there is a severe drainage problem on the curve, which, in the main, is caused by the fact that each heavy rain washes from the mountain side tons of soot and cinders which are

deposited there from the stacks of locomotives. This material rapidly fills the bermes and ditches along the track and seriously interferes with the drainage of the roadbed unless removed. During the winter months when the heavier work of track maintenance on the curve is reduced to a minimum, there is the problem of snow and ice removal on the curve, a problem which is said to equal that encountered by

necessary to do practically all track work under traffic.

One of the exceptions to working under traffic is in the laying or changing over of rails, when an attempt is made to secure the track for as long as 30 to 45 min. at a time. In making rail changes, all of the rail is handled by men with tongs and is placed in the track between the double shoulders of



An Airplane View of the "Horse Shoe" in the Confining Ranges of the Alleghenies

certain of the western roads in crossing the mountains near the Pacific coast. This problem is solved only by the use of a large amount of snow fighting equipment.

#### Methods of Carrying Out Track Work

All of the extensive work on the tracks of the Horse Shoe curve is done by section and extra-gang forces, which must carry on their work with frequent interruptions by trains and with a limitation in the amount and character of the work equipment which they can employ. This applies particularly to equipment which requires the use of a track and, to a certain extent, to other equipment which requires movement over the track and suitable space for setting off adjacent to the track. In view of the heavy traffic on the curve also, no motor or hand cars are used by the track forces, who are carried to and from work by either local passenger trains or work trains. For the same reason, it is

the tie plates without pre-curving. After the rail has been spiked in place, the angle bars are applied, and the tightening of the bolts draws the abutting ends of adjacent rails into the true contour of the curve. In regaging the tracks, which is done about three times a year, it is the practice to alternate the moving in of the rails, beginning with the high rail. All five spikes in the tie are withdrawn in this work, and all of the spike holes are plugged with tie plugs before the rail and tie plates are respiked.

General raising and resurfacing of the tracks on the Horse Shoe, together with tie renewals, are done under flag protection, and owing to the difficulties of using mechanical equipment in this territory, practically all ballast tamping is done with picks. The usual lift given the tracks each year ranges from one to three inches, the larger lifts being necessary in Tracks 1 and 2, which are subject to the pounding of the larger tonnage moving down the hill. All ballast and ties required in this work are delivered

to the curve in work trains, and any such auxiliary movement of these materials as may be necessary is done with one-rail track barrows.

#### Four Methods of Cleaning Ballast Are Used

Cleaning the ballast on the curve is done by several methods, none of which, however, interferes with the movement of trains. The ballast in the cribs of Tracks 1 and 2, and in the outside shoulder of Track No. 1, is cleaned with forks, while the intertrack space between these tracks is cleaned with "moles." As mentioned previously, the finer ballast in Tracks 3 and 4 is not disturbed in cleaning, it being the practice merely to remove the cinders from the top surface of the ballast section where the larger percentage of them are retained. In the inter-track space, and on the ballast shoulders, this cleaning or scraping of the surface is done with shovels, while between and just outside of the rails the cinders are removed by a mechanical track sweeper which was developed on the Pennsylvania several years ago. This machine, which is used in connection with a work train, is run over this territory every three months.

The magnitude of the ditching operations on the Horse Shoe and, in fact, throughout the mountain territory, is seen by the fact that the supervisor on this territory is assigned a ditcher train nine months of each year, for use on the 23 miles of line under his supervision. This is in addition to a combination wrecking and work train which is kept under steam constantly for service on this section of line. To cope with the severe winter storms which prevail in this territory, the supervisor is also assigned two Russel wing and flanger plows, two boxcar flanger plows, five engine flangers and two Jordan spreaders.

All of the track work on the Horse Shoe is carried out under the direction of R. W. E. Bowler, division engineer, with C. F. Miller, in direct charge as track supervisor.

## An Analysis of Grade-Crossing Accidents

**I**N AN EFFORT to solve the important problem of highway-railway grade-crossing protection, the California Railroad Commission has made a statistical analysis of grade-crossing accidents within that state during the last three years. At the present time the railways in California have an investment of approximately \$3,000,000 in grade-crossing protection which entails a maintenance cost of about \$800,000 annually, but notwithstanding these expenditures, accidents occur at many of the crossings which are protected by the most improved automatic devices now in general use.

These are approximately 14,400 grade crossings in the state, of which 8,381 or 58 per cent are protected by the standard cross-buck sign on each side of the track. Crossings protected by wig-wags number 1,660 or 11.5 per cent of the total, and include most of the busiest and hence the most hazardous crossings. Flagmen are employed at 214 crossings and manually-controlled crossing gates at 112 crossings, while warning bells only are in use at 176 crossings.

The most obvious fact disclosed in any investigation of accidents at grade crossings is the steady increase

in their number as well as in the number of persons killed and injured, although there was a decrease of 29 deaths and 31 injuries in the state in 1928 as compared with 1927. However, the number of deaths in 1928 was 165 as compared with 83 in 1913, while the number of injuries increased from 377 in 1913 to 732 in 1928. Based on the number of casualties per 10,000 cars registered, the rate dropped from 37.6 in 1913 to 5.6 in 1918, since which time there have been only relatively minor fluctuations in the rate. One factor which is difficult to evaluate is the number of foreign automobiles in the state. If exact figures as to these cars were available, it is probable that a reduction in the casualty rate would be found.

#### Accidents Were Classified

The commission's investigations have been made in accordance with a predetermined plan of classification to obtain the greatest possible amount of relevant information. Thus, accidents have been classified as to the kind of highway, whether city street, country road, or state highway. Another classification has been made to distinguish between automobiles struck by the head end of a train; those struck by the rear end of a train; collisions with the sides of moving trains, and collisions with the sides of standing trains, and a further classification has been made as to the type of protection at crossings where accidents have occurred. A classification has also been made according to the hour of the day at which accidents occur.

By far the greatest number of grade crossing accidents occurred in urban districts, 72 per cent of all the accidents reported in 1928 having been in incorporated cities of not less than 2,500 inhabitants, while only 4.3 per cent of the total occurred at crossings on the state highways.

Last year, 1,310 automobiles were struck by the head end of a train, or 60 per cent of the 2,179 grade-crossing accidents in 1928. It is particularly significant that collisions with the sides of moving or standing trains were 50 per cent as great as the head-end collisions and that the type of protection has little to do with this class of accident, since the number at crossings protected by automatic wig-wags was almost as great as those at crossings protected only by cross-buck signs.

The summaries compiled show that 70 per cent of the accidents occur during the daylight hours, with a morning peak from 7 to 8 o'clock and a higher afternoon peak between 5 and 6 o'clock, which is only logical since these are the hours of greatest traffic density.

#### Can Further Improvement Be Expected?

The question naturally arises as to whether "rock bottom" has been reached and it is useless to expect further improvement in this respect. It would seem that a certain small proportion of automobile owners is too reckless to warrant any expectation of improvement in the casualty rate, but it is not unlikely that, through proper campaigns, a still further reduction can be made. In order to operate a train, an engineman must not only be familiar with the railway rules and physically fit to perform his duties, but is examined at frequent intervals as to these qualifications. On the other hand, prior to 1925, drivers' licenses were issued to automobile owners in California without any examination, and once a motorist is granted a license, he is not required to pass any future examination to show that he is competent to drive a vehicle on the public highways. A regulation requiring motorists to renew their licenses at stated intervals is now before the state legislature for consideration.

\*Abstracted from an article by H. L. Englehardt, safety engineer, California Railroad Commission, published in the June 22 issue of Railway Age, p. 1447.

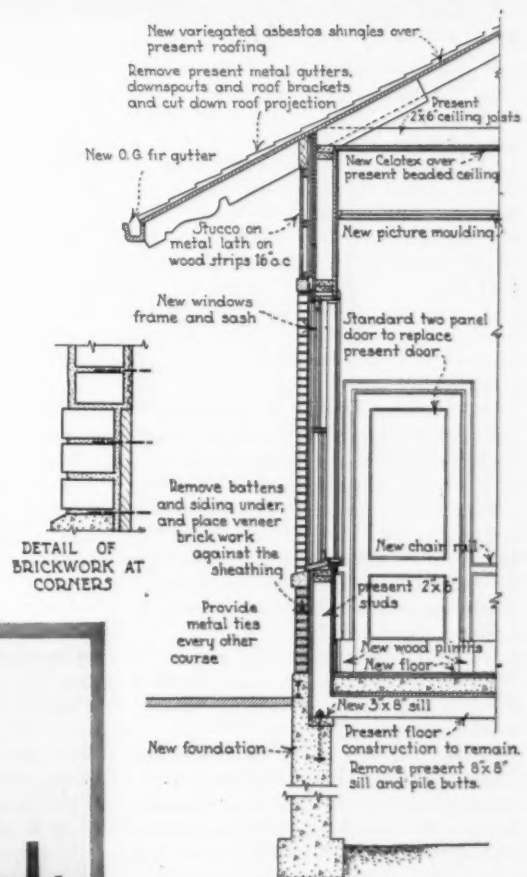
# Burlington Modernizes Passenger Stations

*Reconstructs old structures to present-day standards at a pronounced saving over cost of new buildings*



**A**LTHOUGH the greatest decline in the patronage of passenger trains has been that portion of it originating in the smaller towns, the citizens of many of these towns are constantly demanding that the railways replace their older passenger stations with new buildings of improved appearance. This attitude arises largely from the feeling that a modern station of pleasing and substantial aspect provides an excellent means of advertising the town to the passengers on passing trains. The railroads, also, are alive to the value of neat, well maintained stations as an advertising medium from their standpoint, but to meet the constant demand for new station buildings in the face of their decreased importance as a source of revenue is a problem of no small consequence.

The Chicago, Burlington & Quincy has studied this problem actively for a number of years and has found that in many cases, the demand for a new station is based on the fact that the old station does not meet prevailing ideas of an up-to-date building. It conforms to an obsolete or ill-chosen style of architecture and the plumbing fixtures and the heating facilities do not comply with modern standards. On the other hand, the building in most cases is still structurally



The drawing shown above is typical of the plans prepared for the modernizing of old stations. The two views are examples of buildings that have been remodeled



sound, and except for severe wear of the old wooden floors, is still in excellent physical condition. Because of decreased patronage there are almost no cases where the old station can be criticized on the ground of capacity; in fact, in one case study indicated that a considerable reduction in the size of the station could readily be made.

These matters have all been carefully taken into account whenever the replacement of an old station is under consideration and it has been found that in many cases a program of modernization will provide the equivalent of a new building of current architectural style at a large saving over the cost of an entirely new building.

Most of the old stations are of frame construction with outside walls finished with drop or lap siding, or even with boards and battens. Roof overhangs are supported by heavy brackets, often of ornate design. The interiors are finished with beaded or V ceiling. Therefore, the most important feature of the reconstruction of the stations comprises the modernization of the walls, both inside and out.

#### Generally Use Brick Veneer and Stucco

For the outside, the Burlington has generally adopted a brick veneer base to the level of the window sills, topped with a sill course of precast concrete, the brick being extended up at the corners to form quoins. The balance of the wall surface is covered with stucco on metal lath. As many of the old buildings are supported on wooden sills resting on pile stubs, this exterior treatment calls for a new concrete foundation, which not only serves as the support for the brick veneer base, but is also carried up above the platform level to provide an architectural base for the wall treatment. The greater wall thickness introduced by the addition of the brick veneer and stucco necessitates new window and door frames, and new window sash and doors are also provided.

The roof overhang is shortened if necessary to obtain the proper proportions for appearance, the brackets are removed and necessary alterations made in cornices, including provision for wooden or metal gutters to harmonize with the form of cornice used. In general, no change is made in the roofing unless it is ripe for renewal or is entirely out of harmony with the general treatment of the exterior.

Interior walls are generally made of plaster or a plastic paint application is used. Old wooden floors in waiting rooms and toilet rooms are replaced with a tile floor and base. New interior doors are provided in the public spaces as well as new ticket windows and grille.

In addition to the new walls and floors, modern toilet facilities are usually provided. Electric wiring and modern fixtures are also installed. If the heating plant is of obsolete pattern or inefficient, a modern heating plant is provided.

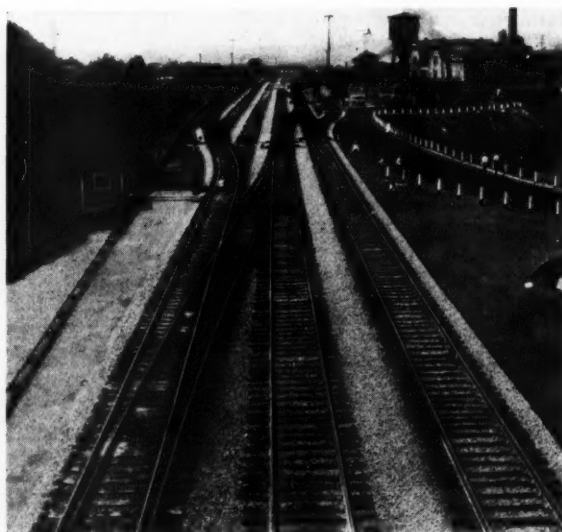
In some cases, the improvement program has included no particular change in arrangement or floor layout of the station, but in others, some changes have been found desirable. At one station, for example, the agent's office was cut down to permit of an enlargement of the toilet rooms. At another, even more extensive changes were made. The station at that place had a total length of 168 ft. and the facilities included freight, baggage and express rooms and separate waiting rooms for men and women, the latter being located on opposite sides of the office. A study of the requirements indicated that these

facilities were larger than necessary and that the waiting rooms in particular could be reduced in size. Accordingly, the floor plan was revised to make one of the old waiting rooms serve the purpose of two, with provision for a small rest room for women, and the space occupied by the men's waiting room was altered to provide for its use as a baggage room. This change, together with a reduction in the size of the freight room, made it possible to shorten the building 46½ ft. These changes were accompanied by other alterations designed to improve the convenience and attractiveness of the facilities, including the addition of a bay-window extension of the office.

#### The Procedure Followed

This general plan for the modernization of passenger stations as carried out on the Chicago, Burlington & Quincy, was developed by W. T. Krausch, engineer of buildings for that system, and the preparation of plans and the execution of the work on the various stations is carried out by the building department under his direction. The procedure, when the modernization of an old station is under consideration, is to have a thorough inspection of the structure made by a building expert from the office of the engineer of buildings, in company with the master carpenter of the division on which the station is located. The information as to the physical condition of the building, obtained as a result of such an inspection, forms the basis of studies and estimates for the improvement of the station, which are submitted to the management by the engineer of buildings, in whose office complete plans are prepared after the work has been authorized.

The reconstruction of passenger stations on the Burlington, is carried out in part by company forces and in part under contract. As the exact extent of the work of alteration depends upon the exact physical condition of the building frame, which cannot always be ascertained until the work has been opened up, it has been found preferable to make alterations by company forces, so as to permit more readily of changes in the extent of the work to be done as determined by the physical condition. On the other hand, brick work, stucco, plastering or plumbing are more often done under contract.



Three Main Tracks and Station Grounds of the C. & O. at Russell, Ky.

# How an 1,800-Ft. Track Pan Was Renewed in 155 Min.

**F**ACED with the necessity of effecting the prompt renewal of one of its important water pans without interfering with the taking of water by any of its important trains, the New York Central recently substituted for the usual method of doing this kind of work, which would have interrupted water service for more than a week, a method whereby the entire work of renewing the old pan was accomplished in 2 hr. 35 min. This unusual record was made in the replacing of an old seven-inch pan in the westbound main track of the New York Central at its Seneca River water station, about 32 miles west of Syracuse. Owing to the large number of men required to make this change quickly, the cost of the work was slightly more than it would have been under the usual method, but it proved entirely practical and obviated the expense and inconvenience which would have been incurred otherwise in making it necessary for trains to take water at another point temporarily.

## Preliminary Work Made Rapid Change Possible

The old pan at Seneca river was 1,800 ft. in length and consisted of 2 end and 53 intermediate sections, all joined with riveted connections. In the usual method of renewing such a pan, water service would have been discontinued at the station, the old pan would have been thrown out of position, and the new pan would have been built up in the track, section by section. In the method adopted, the entire new pan was built up complete on short sections of rail just outside the track, and when the old pan was thrown out, it was then only necessary to line the new pan into position and make four water connections.

The new pan was delivered to the site by work train, in sections, which were distributed along the outside shoulder of the track. In assembling the pan, the end sections, which were 36 ft. in length, and the intermediate sections, 33 ft. in length, were lined up in order about 5 ft. 6 in. from the center line of the track, and supported on 8-ft. lengths of old 80-lb. rails. These short rails, which were laid on the ends of the ties, and parallel with them, were placed under the ends of the pan sections, providing an even bearing for the pan so that the ends of adjacent sections would come together in true alignment and surface for riveting. The rails also afforded a suitable surface over which the new pan could be skidded when it was lined into position later.

With the pan thus set up, four riveting gangs made the strap riveted joints, in each of which thirty-five ½-in. field rivets were necessary. Each of these



The New Water Pan Is Seen at the Left

gangs was equipped with a hand rivet forge and hand tools for driving and bucking up the rivets, and together, the four gangs drove the 1,890 rivets in about 1½ working days.

When the eight-inch pan was completely assembled, a suitable time was set between important trains for changing out the old pan, and within 155 min. after the work was begun, the complete change-over was made, even to the extent of filling the new pan with

water, ready for service. In carrying out this more critical part of the work, the four water connections to the old pan were disconnected simultaneously by separate gangs; the old pan was then lined out as a single unit into the intertrack space, and following closely this phase of the work, a large force of men was set to dapping those track ties which required additional dapping in order to true them up with the other ties in the track. All of this latter work was done with adzes, and with axes which were used to make the side cuts in the recesses in the ties.

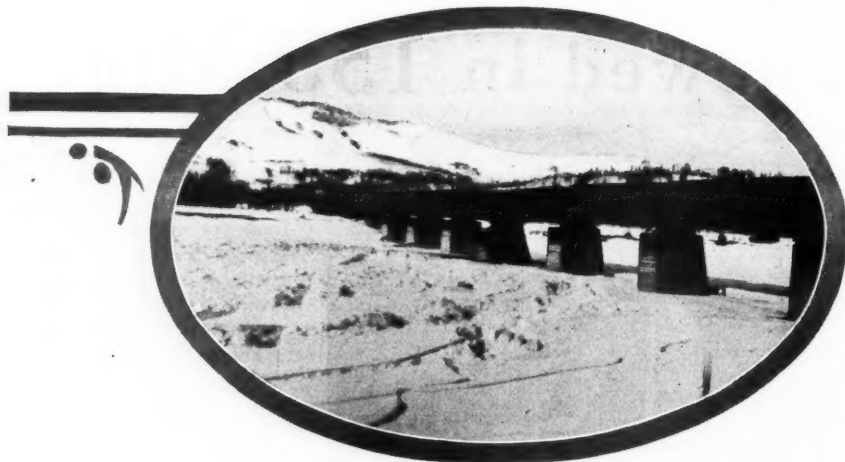
After this phase of the work was completed, another gang of men lined the new pan up over the near rail of the track onto 3-ft. lengths of 4-in. by 4-in. steel angles spaced at frequent intervals along the track, directly over the centers of the ties. As the pan was given true alignment, the short angle sections were removed and the pan was lowered to its final position, and as each water connection was reached, the necessary inlet and rivet holes in the bottom of the new pan were cut with acetylene torches.

Approximately 100 men were employed, 60 of whom came from the bridge and building department of the road. The remaining men were secured from the track forces, and assisted primarily in handling the pan sections and in the lining work. Owing to the necessity of having such a large force on hand to effect the rapid renewal of the pan, and the unavoidable idleness of some of these men during certain phases of the work, the cost was higher than what it would have been ordinarily, amounting to \$1.60 per lin. ft. of pan. In similar work done previously by sectional method, the average cost of the work has amounted to about \$1.48 per lin. ft. of pan.

The work of renewing the pan at Seneca river was planned and carried out under the general supervision of P. H. Winchester, division engineer at Syracuse. The actual work was carried out under the direction of E. L. Jenkins, supervisor of bridges and buildings. We are indebted to Kemper Peabody, general supervisor of bridges and buildings, Buffalo and East, for the information contained in this article.

# Prompt Repair Work

## After Scour



*Ice jam was cause  
structure on a Great*

A View of the Ice Jam on the  
Downstream Side of the Bridge

LATE last winter, the Great Northern experienced considerable trouble with one of its branch-line bridges on account of the movement and settlement of one of the main piers supporting the adjacent ends of two 150-ft. truss spans. The bridge referred to crosses the Columbia river at Marcus, Wash., on the line between Marcus and Oroville. The principal portion of this structure consists of nine timber Howe truss spans, each 150 ft. in length. In addition there are timber trestle approaches at each end of the bridge,

making the total length of the structure 2,109 ft. The spans are supported on pile and frame timber piers encased with timber cribbing and filled with rock. A large amount of rip-rap is arranged in the usual manner outside of the cribs to prevent the piers being undermined by scour.

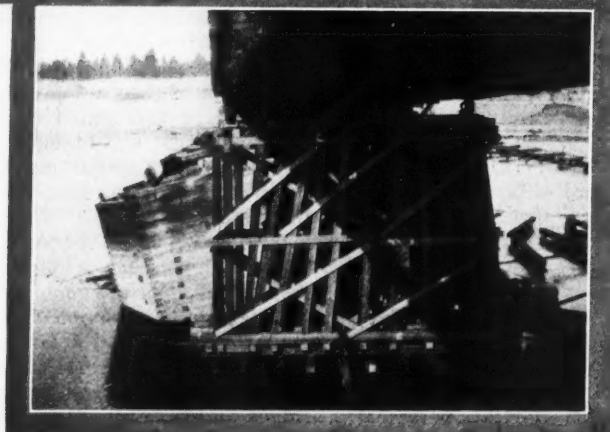
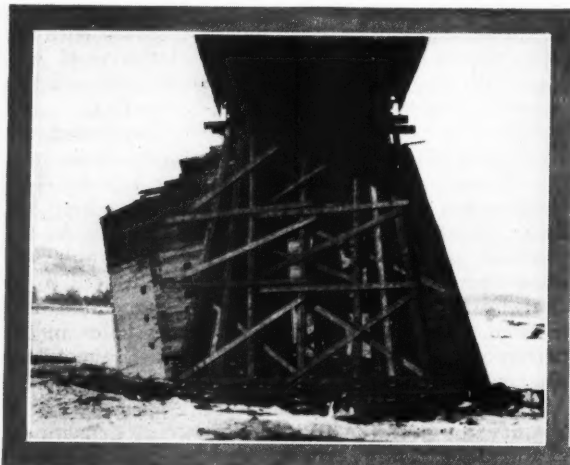
This bridge was originally constructed in 1902, and the portion of the structure above low water line was completely rebuilt in kind in 1914. In addition to carrying regular railway traffic, this structure is also arranged to handle highway traffic.

The Columbia river, at this location, is confined to a channel 1,150 ft. wide that is about 30 ft. deep at low water stage. The high water line is 38 ft. above the low water line. The structure of the river bottom consists of rather soft shale overlaid with a layer of gravel and small boulders.

### No Ice During Most Winters

Ice rarely forms in the stream at this location; in fact, the records show that the stream has frozen over at this point on only two occasions during the last 30 years. However, owing to a rather long period of unusually low temperatures last winter, a sheet of ice ranging from 6 in. to 12 in. in thickness formed in the vicinity of the bridge, extending about 2,500 ft. upstream and about 1,000 ft. downstream. In addition to the formation of the solid ice on the surface, a large amount of slush ice (sometimes called pack ice or anchor ice) formed in the stream and was carried along as part of the flow.

About 850 ft. below the bridge there is a gravel-bar island about 400 ft. wide. The flow of slush ice lodged against this gravel bar and filled in the space between the river bottom and the solid ice on the surface. This ice pack increased in area until it extended upstream to the bridge, and then packed



The two views at the left show successive stages in the construction of the east temporary bent

# Saves Bridge Spans

## *Displaces Pier*

*of damage to wooden  
Northern branch line*



How the Two Spans Were Displaced  
By the Settlement of the Pier

in between some of the piers, in this manner practically closing some of the channels between them. In the deeper portions of the channel, this ice pack had sufficient buoyancy to raise and break the surface ice, as is clearly indicated in one of the illustrations. A close-up view of the ice pack is seen in another view which shows how the top of the pack ice was raised about 15 ft. above the level of the stream.

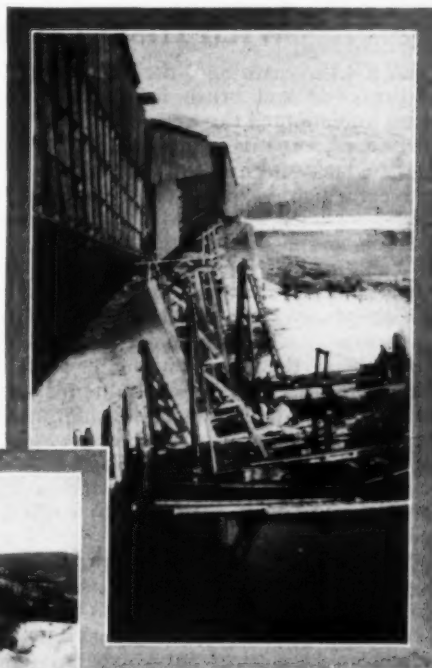
### **Rapid Flow Results in Scour**

As some of the channels between the piers were obstructed by the ice pack, the velocity of flow of the stream was, of course, materially increased in the remaining channels between the piers. This resulted in the scouring of the river bottom in the vicinity of Pier 6, and was the immediate cause of the movement and settlement of this pier. The pier moved out of the line 22 ft. at the top, and settled 20 ft. at its downstream end. The movement did not take place suddenly, but occurred at a rather uniform rate of from one to two feet per day for a period of about two weeks. The placing of additional rock outside of this pier increased the rate of movement. The two 150-ft. Howe truss spans supported by this pier were carried out of line and surface, and were rather badly twisted.

Pile drivers were brought to the site and temporary pile and frame piers were constructed on each side of

the pier and the Howe truss spans were then jacked back to line and surface on these.

The only parts of the Howe truss spans which were seriously damaged were the lower chords at the end panels in the vicinity of the truss bearings. It was necessary to shorten both of these spans to a length of 125 ft. by cutting off the end panels. These spans were then moved endwise toward Piers 5 and 7, respectively to restore them to full bearing on these piers and the opening between the ends of these spans (as supported



Above — Construction  
operations on the tem-  
porary bents



At the left—A near  
view of the ice jam

on temporary piers) was filled in with a 48-ft. deck plate girder span. Old Pier 6 was then removed down to the water surface.

During the time that the temporary piers were being constructed, the weather moderated, causing the ice jam to break up and disappear, without further damage to the bridge. After the ice was gone, the contour of the river bottom in the vicinity of the bridge site was determined by soundings and it was found that upstream from the bridge, the river bottom is comparatively regular, but downstream from the bridge it has been scoured to a depth of about 55 ft. below the normal level of the river bed. The large amount of scour in this vicinity can be accounted for as follows:

The construction of bridge piers and the placing of large amounts of rip-rap around the piers formed an obstruction in the channel which interfered with the normal flow of the stream and resulted in the formation of eddy currents which scoured the river bottom downstream from the bridge. It is possible, and also probable, that this scour has been taking place continuously since the time when the bridge was constructed, the material scoured out being deposited a short distance downstream to form the gravel bar referred to above.

On account of the formation of the ice pack, it is probable that the velocity of the stream was greatly increased immediately below and adjacent to the ice pack, resulting in rapid scour of the river bottom. If this is the case, it is expected that this large depression in the river bottom will fill in to some extent during the next high water period.

## Oil Track Joints with Insect Sprayers

SEVERAL years ago, the Lehigh Valley gave up the swab and brush for the oiling of its track joints, and adopted the spray, which has proved much more rapid, effective and economical. In the spraying method, it employs the ordinary potato-bug sprayer, which is carried on the back of the operator and shoots its spray from a long-throated spray head under air pressure built up by a hand pump, self-contained within the unit itself.

It is said that the sprayer, as a tool for oiling joints, was introduced on the road by an agricultural-minded foreman who sensed the possibility of lightening and speeding up the work of the men in his gang by using the same tool which lightened and facilitated the spraying of his vegetable plants and shrubs at home. Soon after his experiment, which proved successful, many of these units appeared on the right-of-way, and today they form one of the standard units of equipment furnished to each section gang on the road.

While several makes of sprayers are being used, the most common on the road is the Brown Auto-Sprayer, manufactured by the C. E. Brown Company, Rochester, N. Y. This sprayer consists essentially of a cylindrical galvanized container of three gallons' capacity, with a long spraying nozzle which permits the application of oil to the joint bars at close range, while the operator stands in a normally erect position. From 10 to 15 strokes on the pressure pump, after the cylinder has been charged with oil, develops sufficient pressure within the tank to spray about 25 joints, while the full charge of oil is sufficient to spray about 72 joints with 38½-in. bars.

The oil from the sprayer is controlled by a grip lever in the hand of the operator, and emerges from

the nozzle in a cone-shaped spray with force sufficient not only to insure the thorough coating of all of the exposed faces of the rail joint bars and their fastenings, but of sufficient intensity to force its way completely through the opening back of the rail joint bars where it reaches the hidden parts of the joint plates and fastenings.

### Use Worn Crankcase Oil Mixture

Almost any grade of oil seems suited for application by the sprayer, but the Lehigh Valley is using a crude oil with which it mixes worn crankcase oil secured from gasoline filling stations at various points along its lines. The practice of adding discarded crankcase oil was adopted when it was found



Oiling Joints with a Bug Sprayer—Note Spray Emerging from Behind the Joint Bar

that large quantities of this oil were available at many filling stations, which were glad to have the railroad truck it away. At some points, a small sum is asked for the oil, but ordinarily enough can be secured free to make it unnecessary to purchase any, even at the small cost asked.

By utilizing old crankcase oil, the trucking charge on which is relatively light, and mixing it with even a poor grade of crude oil, a highly effective joint bar oil has resulted, which is readily applied by the insect sprayer and at a rate about twice as fast as it can be applied with either a brush or a swab.



On the Delaware Division of the Erie

# Slabs Weighing 240 Tons Are Moved on Rollers

*Seaboard Air Line  
develops ingenious  
method of handling  
precast units for  
highway grade sep-  
aration structures*



*The Completed Structures Present a Fine Appearance*

**G**RADE eliminations on the highways of the several states through which the Seaboard Air Line operates have necessitated numerous underpasses, and in most cases these structures consist of plain concrete abutments, with necessary wingwalls to retain the fills, and a precast solid concrete slab reinforced with plain or deformed bars. The design of both slabs and abutments follows standard practice.

The slab is cast on falsework at one side of the track and is later rolled into final position. The slabs built up to this time are 14 ft. wide, from 4 ft. to 4 ft. 6 in. thick, from 31 ft. to 44 ft. long, and weigh from 110 to 240 tons, including the ties and ballast placed before the spans are moved in. When the first precast slab was designed, little information could be found relative to the handling of slabs as heavy as these. For this reason the method developed by the engineering department of the Seaboard may be of interest. At present, the time required to place these slabs is less than that occupied in placing a steel-girder span of equal length. Precast slabs will be used extensively by the Seaboard on future work.

The bottom of the slab, when cast, is about on a level with the bridge seats and the center of the slab is from 18 ft. to 24 ft. from the center line of the track. It is placed at that distance to allow space for a preliminary movement to test out the tackle,



*A Track Slab Just After It Has Been Set*

anchors, hoists, etc. before the final pull, and, as the moving of the slab is a small matter, the tryout is worth while.

The design of the falsework for the slab and also for the track has an important bearing on the method of handling. Two double bents on four-foot centers, located at about the third points of the span, are used for the rollways and must be designed to carry the total load of the slab. These bents are cross-capped and the caps carry two 12-in. by 12-in. timbers, bolted together, which in turn carry a steel plate,  $\frac{3}{4}$  in. by 20 in., for the rollers to work on. Additional bents are provided as required to carry the fresh concrete, and are removed after the concrete has hardened. The end bents to support the new concrete are cut off low enough to allow jacks to be placed on them and under the ends of the slab. Blocking placed on the bents to support the forms are removed when ready to raise the slab.

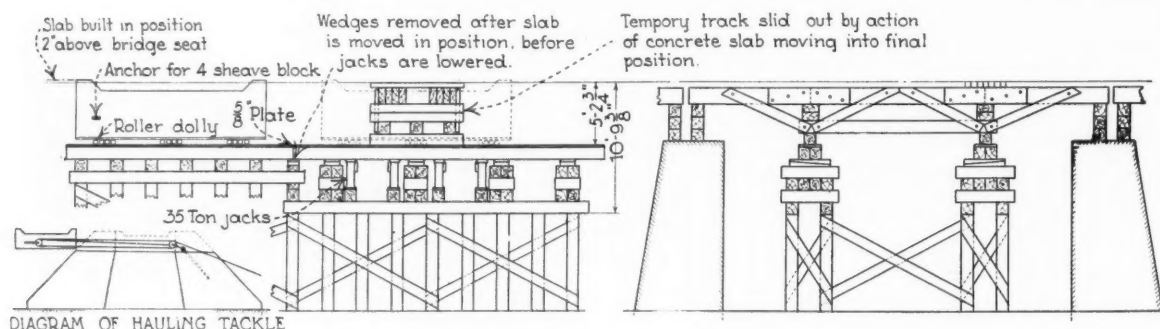
The support for the rollway under the track or under the final location of the slab is somewhat different. While the rollway timbers are continuous for a length sufficient to move the slab into place, the rollway timbers under the final location of the slab are placed on top of sufficient self-lowering jacks to carry the weight of the slab while it is being brought to position over the bridge seats. Piles are always used for the track falsework when it is possible to drive them. These are first cut off, and capped to carry 8 in. by 16-in. wood stringers or beams. When the slab is to be set, the piles are cut off low enough to be cross-capped and receive transverse caps. These support the jacks which carry the rollway. Blocking is placed between the jacks while the span is moved in, with hard oak wedges at the top of the blocking to provide for the quick removal and the transfer of a load to the jacks. The rollway is built about three inches lower than the bridge seats, and as the roller dollies have a depth of five inches, it is necessary to lower the slab about two inches to the bridge seats. For the smaller slabs, four dollies are used, and for the larger slabs, six dollies.

Each dolly is made up of four 3-in. rollers 8 in. long, spaced 6 in. center to center. A three-inch section of each end of the rollers is turned down to a

diameter of two inches and over these bearings are placed half bronze bushings, which in turn, are fitted to a half circle cut from the bottom edges of two heavy angles, placed back to back and riveted to a  $\frac{3}{4}$ -in. by 18-in. by 22-in. cover plate. These dollies have proved very efficient. A minimum of power is required to move the slab, and as they do not move with reference to the slab, they are far superior to

working properly, but is rigged to be available if required.

When ready to move the span into place, rollers are placed under the deck of the track falsework also, and this is pushed out as the slab moves in. Before starting the final movement of the span, the rails are jacked up six inches and blocked back of each abutment so that the slab may move under them. When



General Features of the Falsework

loose rollers which are continually getting out of line and increasing the load on the hoists.

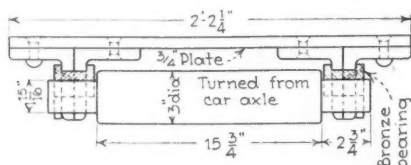
It is essential that care be used to build the rollway parallel to the center line of the highway and that the rollers be placed parallel with the rollway so that the span will not roll out of line while it is being

the slab is in position, the rails are lowered on the ties already in place and the spiking is started at once. By the time the wedges are removed and the span is lowered, the track is ready for train movements.

#### Placing of Slabs Requires Little Time

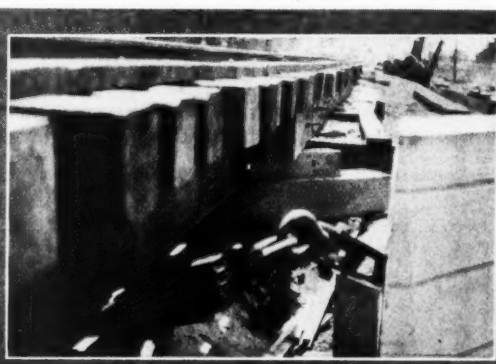
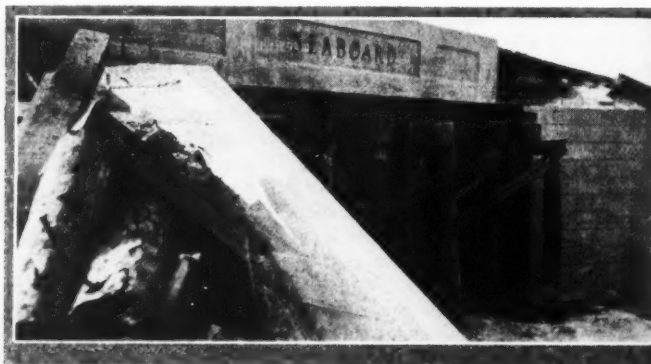
For the last span set, on the Seaboard Air Line, which weighed 230 tons, the track was out of service only one hour, and the next span, now under construction and weighing 120 tons, should be placed in 45 min. Six minutes were required to move the 230-ton span 14 ft. to final place and the rest of the hour was taken up in jacking up the track, falsework changes and removing the wedges on the blocking, which gave some trouble in that case. All of the underpasses built thus far were constructed by company forces, reporting to the bridge engineer. Six precast spans have been placed to date, with one more under construction and drawings for three others completed. One of these drawings covers a span with a total length of 54 ft.

The method of placing the spans was developed by



Details of the Roller Dolly

moved into place. The power required for the smaller spans is a 15-hp. double-drum steam hoist, pulling on two sets of four-sheave blocks reaved with  $\frac{3}{4}$ -in. steel cable. One block is attached to a U-bolt in the outer end of the slab and the other is attached to an eye-bolt set in the top of the wingwalls, which are concreted to bridge-seat level in advance and



Views Showing Some Details of Falsework and the Hauling Rig

completed after the slab has been placed. For the heavier slabs, a second pair of three-sheave blocks is rigged to a double-drum gasoline hoist. This set is not needed as long as the four-sheave blocks are

J. B. McClain, engineer of bridges, under whose direction the structures have been built, subject to the approval of E. A. Frink, principal assistant engineer, and W. D. Faucette, chief engineer.



Photograph courtesy the Railroad Gazette (London)

*A Typical Section  
Gang on the Shire  
Highlands Railway  
in Africa*

# Around the World With the Track Man

*Materials and labor of widely varying character impose  
problems not faced in America*

By SIR GORDON HEARN

Editor of "Permanent Way," by the late W. H. Cole, London, Eng.

AMERICAN railway men naturally are interested chiefly in their own problems. Nowhere in the world have the weights of locomotives been so increased, while the speeds at which trains are run requires that the roadway and track be maintained to very high standards. In Great Britain, and the British Empire also, the maintenance of the tracks to a high standard is a matter of pride, even to the extent of inducing an expenditure which may not always seem justified. The track must be maintained by labor of varying degrees of intelligence, seldom up to the standard of that of the maintenance forces in the United States of America. Outside the ranks of the supervising grades, English is little understood except in Great Britain, Canada and Australia, and this adds to the difficulties caused by lack of intelligence and physical strength. These difficulties are not entirely unknown, however, in the United States, where an extensive railway system demands the recruiting of an enormous labor force from outside the ranks of an English-speaking people.

## Various Gages Are Used in British Empire

One difficulty is of very small proportions in the United States, where only a small proportion of the track is laid to other than the standard gage of 4 ft. 8½ in. In Great Britain this is also the standard, with the exception of a very small mileage. The Great Western (of England) broad gage of 7 ft. has

long since been brought to standard, but in the British Empire, excluding Canada, which naturally conforms largely to American practice, the standard gage is the exception and no other standard takes its place. In India, there is not a yard of railway laid to standard gage. In Australia, except in New South Wales, only the Trans-Continental Railway has this gage. In Africa, only in the protectorate of Egypt do we find this standard, the remainder of the British-constructed railways being of the 3 ft. 6 in. and meter (3 ft. 3¾ in.) gages. The first railway in South Africa was laid to this gage, but has since been narrowed to 3 ft. 6 in. The 5 ft. 3 in. gage in Ireland and Australia, the 3 ft. 6 in. gage in Africa and New Zealand, the meter gage in India, Malaya and Kenya, with the 2 ft. 6 in., and the 2 ft. gages in many places, all have their particular standards of track and of turnouts.

The narrower gages usually have the advantage of youth in having been built with the greater experience of their elders. In particular, they are less confined by the loading gages adopted and are more capacious. In India, the wide gage of 5 ft. 6 in. was built with a center-to-center distance of only 12 ft., and, although the policy now is to increase this to 15 ft. 6 in., it will take many years and large expenditures before this is in full effect, the more so since the permissible height also is to be increased, requiring the rebuilding of all overhead structures.

In Africa and British India, 3 ft. 6 in. and meter-gage cars may even approach in width the cars running on British railways, restricted as these dimensions are, in comparison with those of American railways, in width and in height.

#### Lighter Rail Is Common

These restrictions of loading gage render impossible the use of the giant locomotives of American railroads, and consequently restrict the axle loads in general use. Consequently, also, the standard weight of rail of the British Railway Companies Association is low, 95 lb. per yard. At the same time, the effective strength of the rail is increased by carrying it in chairs, weighing 46 lb. normally and 53 lb. at the joints. The rail is of "bull-head" section, the surplus metal being thrown into the head to provide for longer wear in a closely settled country where sharp curvature has been necessary for economic reasons.

With the exception of a certain mileage in British India and elsewhere in special localities, the "bull-head" rail is not adopted in the British Empire, the T-rail being paramount. But, generally speaking, weights of the T-rails are low, although on the 3 ft. 6 in. gage in Africa an 80-lb. rail is standard. In India, except on very severe grades, a 90-lb. rail is deemed adequate for the 5 ft. 6 in. gage, and 60-lb. for the meter gage. In Australia, 80-lb. rails are standard for the wide gages. A very heavy traffic can be carried over these rails for many years without undue wear and, after all, ideas of European railway men do not demand anything much heavier, although loads and speeds are relatively high, but the



Photograph courtesy S. A. Williams, Ltd.

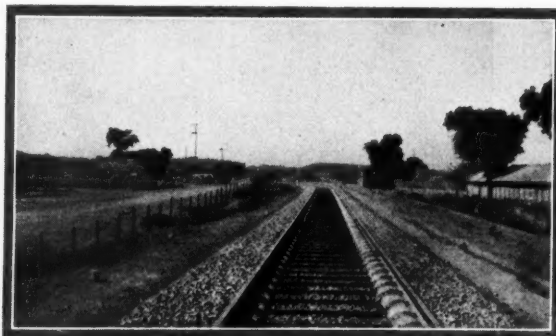
#### Replacing Rails on Stent Concrete Ties on a Main Line of the London & North Eastern in England

high standard of maintenance probably has something to do with the life of such light rails. It is a question of economics whether to pay money for more steel, or to get every ounce out of the steel bought.

It must not be supposed that the additional life is gained at the expense of a large number of ties crowded under the rail, or of a large quantity of ballast. From the point of view of American railway men, both may seem inadequate. The British Railway Companies Association allows 18 ties to a 45-ft. rail, or three more than one per yard, but many railways in the British Empire allow only two more, and some only one. It is common practice to keep the rail joints opposite each other rather than stag-

gered, and to space the ties next to the joints in such a way that the joints are given more support. In Great Britain, 12-in. by 5-in. ties are used nearest the joint instead of the normal 10-in. by 5-in. ties, but this practice is not followed in the Empire generally.

The application of preservative processes to softwoods is now proposed in British India. Thirty



Photograph courtesy S. A. Williams, Ltd.

#### Track Laid with Stent Concrete Ties on the India Southern Punjab Railway in India (5 ft. 6 in. Gage)

years ago, creosoted pine ties were imported, but the oil oozed out into the hot sand and the termite completed their destruction in a very few years. In Australia karri ties were "Powellised" for the trans-Australian railway, but this process does not seem to have been an entire success. The enormous scale on which preserved ties have been adopted in the United States has not been nearly attained.

#### Substitute Ties Are Used

A feature of practice in ties is the utilization of steel and cast iron. The first steel ties in British India were of the "peapod" type, hot-pressed into shape in two stages, in the second of which the lugs were pressed up to hold the rail flange, which was secured by a key and cotter in each pair of lugs. The key and cotter had differing dimensions to allow the widening of the gage on curves and also on tangents when the lugs were not exactly to dimension. However, the difference in dimension was usually small and the lugs were hammered to obtain a good lining of the rails.

These ties served their purpose for many years in suitable soils, but in certain tracts, where there were salts in the soil, they soon failed. A bar dropped on the tie pierced the steel like paper and many of these ties had to be taken out, causing the steel tie to fall into disfavor. Of recent years, however, the tide has turned, but the new type is of the clip and bolt type. This makes it easily adaptable to a rail of any section, whereas the old pressed lug did not have this advantage. The curve of the tie in cross-section is not so accentuated, so that the ballast is tamped firmer, and the reinforcement of the edges, by pressing the tie from a double-bulb plate, lengthens the life by resistance to the tamping tool.

The cast-iron ties are of the articulated type. A pair of pedestals, bowls or plates is connected by a wrought iron or steel crossbar. Consequently, there is little resistance to cross-bearing stress, and the bearing conditions must be exceptionally good. Many thousands of miles, however, are laid with this form of tie, and much of it is run over at high speed. At the same time, the line and surface are difficult to

maintain, and the track is distinctly rough, compared with track laid with wooden ties. Long experience has enabled the maintenance gangs to attain a fair standard, but not a good one.

Where these ties are of the bowl type, the ballast used contains a proportion of sand, but, in course of time, dust becomes incorporated with it and rain cements the ballast into a mass which must be broken up. The tamping for this type is done by "punning" the graded material through holes in the top part of the bowl. With the pedestal or plate type, the ordinary tamping tools are used.

#### Defects of Circular Bowl Type

A circular bowl has shown some serious defects, when combined with a long bearing for the rail. This bearing prevents the close tamping of the bowls at the joints and the passing loads cause the bowls to rock on the ballast, the poor support causing the joints to sag under the hammer action. The latest idea is to make the bowls elliptical in plan, the longer axis to be placed transverse to the track, with an increased bearing surface. It is to be hoped

are experienced in the British Empire. Anti-creeper plates are now used in increasing numbers on T-rails, but other steps to reduce the trouble are being taken in the design of steel and cast-iron ties, and of tie plates on wooden ties.

#### Design of Rail Joints

Rail joints are almost universally four-bolt bars, the six-bolt bars of some years ago having been abandoned. British railways have not changed their type in the recently altered specifications of the British Engineering Standards. Extra strength is given in these recent standards by an extension of the bottom flange of the bar, but it is not wrapped round the rail flange as formerly. Free expansion and contraction of the rail are sought.

In British India, the Railway Board has not accepted these recent designs, preferring a thicker but simple four-bolt splice, while retaining the ribs which prevent the rotation of the bolts during tightening. The notching of the splice-bar to engage the spikes is not much approved, it being considered that the ties have enough work at the joints and that the



Photograph courtesy the Railroad Gazette (London)

#### A Gang of Natives Relaying Rail on an African Railway

that this will prove effective, because the life of these ties is from 50 to 100 years, and the scrap value of those broken is considerable. At the same time no enthusiastic maintenance man can really approve of cast-iron ties of the articulated type.

While many experiments have been made with reinforced concrete ties, nothing satisfactory has been developed. Perhaps the best type has been a concrete bowl, similar to the cast-iron bowl. Many miles of this type have been laid in British India, and one English railway is installing a short length for experiment. Nowhere has there been attempted a slab like that of the Pere Marquette near Detroit, Mich., although this would be of great use at turn-outs, where the carelessness of colored switchmen causes frequent derailments in switching.

Rail creeping does not trouble British railways to any great extent, as the short bearing in the chairs and the tight keying of the rail in the chairs appear to be effective in reducing the creeping. Moreover, the changes in temperature are not as great as

prevention of creeping is better done at the center of the rail.

Light axleloads also make it possible to dispense with tie plates on many miles laid with wooden ties. These plates have in the past allowed for a long bearing, but nowadays a short bearing and greater transverse width are given. The advantage of a separate attachment to the tie is not yet accepted or understood, so that spikes or screws are used to attach both rail and plate. Reasons of economy, probably false, are urged and first cost is a prime factor in most cases.

First cost is also a factor in the allowance of ballast. The importance of a roadbed of considerable depth has always been recognized in Great Britain, where a sub-ballast of large broken rock has been provided below the ballast proper. The investigations of the joint committee of the American Society of Civil Engineers and of the American Railway Engineering Association have proved the wisdom of this. In the Empire, good ballast is at times hard to

find, or has to be carried great distances. Six inches, or at most eight inches, of ballast under the ties is as much as is allowed. The embankments at times absorb a considerable proportion of this, but by steady additions as the road sinks, the roadbed contains more than is apparent. Perhaps this is as good a way as any of making a betterment in this item. At the same time the 3,000 cu. yd. recently provided on a new cut-off of the Illinois Central would not be considered sufficient on some new railways for heavy traffic in the British Empire.

#### Labor Conditions in the Empire

In Australia, where labor is highly paid, the American method of increasing the mobility of a small force by motor cars is adopted. On the trans-Australian railway a man maintains as many as 5.37



A Rail-Laying Car on the Khyber Railway in India

miles on the average. On one district in Queensland, six gangs of 38 men maintain 235 miles.

Generally, in the Empire the labor is colored, and two to three men per mile are employed, according to gage, with sections of three miles to a gang. Even so, it becomes necessary to collect two or three gangs if rail changing or turnout work is to be done. For extensive relaying, or pulling back rails which have crept, special gangs are employed, numbering perhaps two hundred men. The use of machine tools for reducing the forces is rare, but in Australia a track layer was used on the trans-Australian, and attained a laying average of over two miles a day in the best week. A mile a day with 400 colored laborers in the tropics would be good going, exclusive of the force required to raise and tamp the track.

#### Little Uniformity in Turnouts

Information about the important item of turnouts is decidedly scanty. It is the more important because of the very long lengths of single line where the majority of the turnouts are "facing." That anything like uniformity of practice can be attained is not possible in view of the differences of gage and the difficulty of getting together engineers from such a vast extent of the world. Many railways have consulting engineers in London, but the extent to which they interchange ideas and information is not known. The British Engineering Standards Association has not tackled this subject.

The British Railway Companies Association has adopted standards for frogs with numbers from 6 to 16 with partly curved switch rails from 20 ft. to 28

ft. 6 in. long. In British India the frog numbers in common use are 12, 8½ and 6, and the straight switch rails have tended to become longer, up to 21 ft.

#### Problems of Switch Design

The use of long straight switch rails is a feature of the standards of the A. R. E. A., and these standards are of interest to the railways of the British Empire which use T-rails. British railways using bull-headed rails have little need to cut away the foot of the rail, except towards the toe of the switch rail and, of course, for the actual frog. The curving of the switch rail reduces the weakening of the rail section to a minimum and the switch rail is held up by a stock rail of full section. The frog is held in special chairs which give it great strength.

A switch rail made from a T-rail must obviously be weakened for a considerable distance, if it is to be kept straight, while at the frog the blocks and bolts have to be fitted carefully if there is to be no rocking of the parts on their reduced flanges. At the same time, locomotives are getting heavier and throw a greater strain on turnouts. At least one railway in British India has adopted curved switch rails, but it is a question whether in the future switches and frogs will not have to be made of bull-headed rails. This question may have to be considered in America also.

It is no doubt generally understood that long straight switch rails have the effect of reducing the radius of curvature of the turnout. Long locomotive wheelbases make this more than ever undesirable. The easiest curve for a given number of frog is attained by calculating for a curve tangential to the main line rail, whereas a curve tangential to the switch rail has a smaller radius. If the switch rail is curved, it is possible to use the easiest radius; otherwise, it is necessary to introduce frogs of higher number, at an increased expense for ties, which use up a very large amount of timber. Uniformity of practice would permit the use of steel ties, which, by the way, have long been used in France.

Curved switch rails have the disadvantage of requiring duplication of spare parts, and of making a switch rail less applicable to a large number of situations, in both straight and curved track. A large number of switches and crossings are imported for the use of the Empire railways, and naturally it is desired to make them useful in almost any situation. But the manufacture of switches and frogs locally is extending, and many railways have their own shops. These are usually placed under the supervision of the signal engineers, whereas in England the shop forms one of the locomotive shops, although there are also several companies for contract work.

Spring frogs of the American design have been introduced into England and on some of the Empire railways, but they are not appreciated and are commonly relegated to situations where the turnout is used for switching or slow speeds. Spring switches are used, but the great majority of switches are of the hinged type. Developments in switches and frogs in America will be watched with interest, but it is seldom that we read about them. In a record of progress of French railroads, published in the Centenary number of the *Revue Generale des Chemins de Fer*, there was hardly a word on this important subject, but the comfort of passengers, at least on single-track railways, is much affected by smooth turnouts.



*On the Northern Pacific West of Livingston, Mont.*

## 20 Years of Treated Ties on the Northern Pacific

*Practice has not only extended the service life of timber  
but has permitted use of so-called inferior woods*

As Told by ANDREW GIBSON

Superintendent, Timber Preservation and Tie-Treating Plants,  
Northern Pacific, Brainerd, Minn.

IN 1907, the Northern Pacific decided to treat all of its track ties and, in order to carry out this policy, erected two treating plants; one at Brainerd, Minn., and the other at Paradise, Mont. The treatment formerly consisted of a solution containing 80 per cent of No. 1 creosote and 20 per cent of refined coal tar, with an injection of approximately two and one-half gallons of solution to the tie, or  $6\frac{3}{4}$  lb. of preservative per cubic foot of wood. Since 1920, this solution has been displaced by one containing half No. 1 creosote and half crude petroleum, which, from all appearances, will give as long a service life as the former treatment, with a saving of ten cents per tie.

Each of these plants, for they are similar in design and equipment, has two treating cylinders 133 ft. long by 7 ft. in diameter, with the necessary tanks and pumps. Current is generated at each plant for lighting and for operating the electric locomotives which handle the tram cars to and from the treating cylinders. Within the last few years, a boring and

adzing machine and an incising machine with a capacity of about seven ties per minute, have been installed at each plant. Surfaces up to 14 in. wide can be adzed and the boring can be done for any section of rail.

### The Plant at Brainerd

At Brainerd the storage yard for seasoning has a capacity of 700,000 ties, piled 8 by 8, while the capacity at the Paradise plant is 760,000 ties. Provisions have been made so that these capacities can be enlarged to 1,000,000 ties whenever it may become necessary to do so. Under normal conditions, each plant has a capacity of 75,000 treated ties a month, working days only.

The Brainerd plant was placed in operation in October, 1907, and had treated a total of 9,832,416 ties to 1929, while the Paradise plant, which began operations in April, 1908, treated 9,556,920 ties from that time to 1929. During the same period 640,164 ties were treated under contract, making a total of

20,029,500 ties treated since the beginning of these activities, with the result that in 1929 treated ties constituted 70 per cent of all ties in track.

The requirements for tie renewals began to show large reductions in 1916. For the five-year cycle ending with 1910, the average annual renewals were 313 ties to the mile on the main lines and 266 ties to the mile on the branches. In 1927 the renewals were 148 ties to the mile on the main lines and 121 ties to the mile on the branches, a reduction of more than 50 per cent since 1910. The appended table shows the progressive decline in renewals since treating was begun.

**Tie Renewals per Mile of Track**

Period	Main Lines	Branch Lines
1905-1910 inclusive	313	266
1911-1915 inclusive	334	242
1916-1920 inclusive	268	219
1920-1925 inclusive	203	167
1927	148	121

Aside from the economy effected in the reduction of the number of ties used annually for renewals, which is reflected both in the cost of the ties and in the labor of placing them in track, there is less disturbance to the roadbed in placing the smaller number of ties, while a marked step forward has been made in the conservation of forest products. If the tie requirements per mile in 1927 had been the same as in 1907, a total of 106,971,800 ft. b.m. of timber would have been used, whereas the actual consumption was 49,497,700 ft. b.m., a difference of approximately fifty-seven and one-half million feet board measure. The value of this saving is further enhanced by the fact that all of the ties treated at Brainerd are of ash, beech, birch, elm, and maple, timbers which are of little value for other purposes and which would not last more than three years if placed in the track without treatment.

#### Test Sections Established in 1919

While the benefits secured from treating ties were self-evident, 18 test sections were established on various parts of the road in 1919, in order to secure more definite information. These sections included both treated and untreated ties of various kinds of wood, among which were untreated oak ties dating back to 1905, tamarack ties placed in 1912 and treated ties, some of which had been installed in 1908. The data for each test section were secured from the dating nails which were inserted in each tie, and the sections are inspected annually, at which time any changes from the last previous inspection are noted on the records.

On these sections, at the time they were established, there were 3,130 untreated ties and 8,161 treated ties, the majority of the latter having been placed prior to 1912. Of the untreated ties, 82.4 per cent had been removed because of decay by 1928, while only 10.9 per cent of the treated ties had been removed during the same period, principally because of damage by derailments or dragging equipment. In some instances, when rail or ballast renewals were made on main line tracks, treated ties have been removed, because of checks or splits, and placed in sidings or spur tracks for further service. Some of the so-called hardwoods, such as ash, beech, birch, rock elm and maple, have a tendency to split, especially in the arid regions, unless they are protected by "S" irons or other devices.

In addition to the test sections already referred to, several others have been established for the ob-

servation of ties made from particular kinds of wood which have short service life when untreated. Thus, one test section was installed in 1917, with 44,159 treated ties of Minnesota tamarack, some of which were removed later on account of the installation of a turnout. These ties had been in service 12 years in the spring of 1929, whereas, if they had been untreated, they would all have been removed by the spring of 1925. Another section in the west-bound main track near the west end of the yard at Missoula, Mont., was laid with 1,637 treated hemlock ties in February, 1910. After almost 19 years service, only six of these ties had been removed.

Other tests were made to determine the suitability of treated cottonwood as tie timber. Two hundred and sixty-one ties were placed on the Bitter Root branch in western Montana, in March, 1910, and in the same year 554 ties were placed in the Palouse branch west of Spokane, Wash. After nearly nineteen years service, only 3 of the ties had been removed on the Bitter Root branch and only 32 of the ties on the Palouse branch had failed. While the traffic on these branches is not heavy, the rail is light and tie plates were not used until the ties had been in place for several years, so that more or less mechanical wear took place.

In addition to ties, the Northern Pacific treats bridge timber, piles, paving blocks, telegraph poles, anchor logs for telegraph poles, and other miscellaneous material.

## Capital Expenditures and Railway Purchases

DATA compiled by the Bureau of Railway Economics show that while the capital expenditures of the Class I railways during the first quarter of 1929 were approximately \$1,300,000 smaller than for the same quarter of last year, amounting to \$127,119,000 as compared with \$128,428,000, the total capital program for the current year as of April 1 shows an increase of \$111,203,000 over that of 1928, and the bureau's forecast that this program will be increased is borne out by the large amount of new work authorized since that date. During the first quarter of 1929, these railways expended \$89,477,000 for additions and betterments to roadway and structures, and while this amount was smaller by \$5,935,000 than the amount expended during the first quarter of 1928, the larger carry-over from the preceding year and the increase in authorizations during the quarter brought the total capital program, as of April 1, 1929, to \$704,960,000 as compared with \$593,757,000 on the same date in 1928, an increase of \$100,916,000. Tables are appended showing the expenditures for various items during the first quarter of the present year as well as a comparison of the capital program and expenditures for roadway and structures for the first quarters of 1929 and 1928.

The materials required for the large construction programs of the railways, as well as for the maintenance and operation of the existing plant, necessitate large expenditures, the total purchases for 1928 amounting to \$1,271,341, according to figures compiled by the bureau. Of this total, fuel accounted for \$384,608,000, or 30.2 per cent; forest products, \$160,794,000, or 12.7 per cent; iron and steel products \$397,544,000, or 31.3 per cent, and miscellaneous materials, \$328,395,000, or 25.8 per cent.

In forest products, the purchases of ties continued to

## Comparison of Capital Expenditures of Class I Railways, First Quarters of 1929 and 1928

Roadway and Structures	1929	1928
Unexpended authorizations brought over from previous year.....	\$293,289,000	\$260,783,000
Additional authorizations during first quarter.....	225,547,000	157,137,000
Total capital program as of April 1.....	518,836,000	417,920,000
Amount expended during first quarter.....	89,477,000	95,412,000
Carry-over of unexpended authorizations on April 1.....	\$429,389,000	\$322,508,000

## Roadway Capital Expenditures for First Quarter of 1929

Roadway and Structures	Unexpended authorizations brought over from 1928	Additional authorizations during quarter ended Mar. 31, 1929	Total amount authorized including carry-over from 1928	Amount expended during quarter ended Mar. 31, 1929	Carry-over of unexpended authorizations
Additional main track.....	\$ 37,727,000	\$ 37,692,000	\$ 75,419,000	\$10,165,000	\$ 65,254,000
Yards and sidings.....	43,353,000	24,890,000	68,243,000	9,921,000	58,322,000
Heavier rail.....	8,455,000	25,149,000	33,604,000	8,502,000	25,102,000
Additional ballast.....	4,321,000	8,044,000	12,365,000	1,622,000	10,743,000
Shops and engine houses.....	16,242,000	20,048,000	36,290,000	5,479,000	30,811,000
Station and office buildings, and other station facilities.....	43,060,000	20,083,000	63,143,000	11,607,000	51,536,000
Bridges, trestles and culverts.....	49,586,000	28,977,000	78,563,000	12,572,000	65,991,000
Signals and interlockers, including telegraph lines, telephone lines, automatic train control, etc.....	7,092,000	15,173,000	22,265,000	5,199,000	17,066,000
All other improvements.....	83,453,000	45,491,000	128,944,000	24,410,000	104,534,000
Total roadway and structures.....	\$293,289,000	\$225,547,000	\$518,836,000	\$89,477,000	\$429,359,000

Note: Additional track includes rail and tie fastenings and other track material. Shops and engine houses include machinery and tools.

show a downward trend, owing to the widespread practice of preservative treatment, 88,774,000 crossties having been purchased at a cost of \$95,684,000 last year, as compared with 97,135,000 at a cost of \$108,215,000 in the preceding year. Likewise, 258,462,000 ft. b.m. of switch and bridge ties were purchased in 1928, costing \$9,376,000, as compared with 326,735,000 ft. b.m., costing \$12,127,000, in 1927. Timber and lumber purchases in 1928, amounting to 1,353,800 ft. b.m., were greater in volume than in the preceding year, when 1,285,289,000 ft. b.m. were purchased, but the outlay was smaller, \$6,136,000 as compared with \$7,200,000 in 1927.

In iron and steel products, 2,080,000 tons of steel rails were purchased during the year, at a total expenditure of \$92,181,000, while frogs, switches, crossings and track fastenings entailed a further expenditure of \$67,376,000. The purchases of steel bridges, turntables, structural steel and steel parts amounted to \$45,001,000.

Among the miscellaneous material were cement, of

which 3,060,000 bbl. were purchased in 1928, at a cost of \$6,300,000, as compared with 2,673,000 bbl., costing \$5,811,000, in 1927. Ballast purchased during 1928 amounted to 27,156,000 cu. yd., at a cost of \$23,749,000, as compared with 28,430,000 cu. yd. at a cost of \$23,965,000 during the preceding year.

In spite of these large expenditures, the railways effected a reduction of \$53,291,000 in their stocks of fuel, ties, rail and other unapplied materials and supplies during 1928. The total value of materials carried in stock by these roads at the end of 1928 was \$471,889,894 less than that at the close of 1916.

Of the 117 railways or systems included in the summary, 85 showed reductions in stock, and 19 of these roads made reductions of more than a million dollars. The Pennsylvania effected the largest reduction, its material balance at the close of 1928 being \$6,639,252 less than at the close of the previous year. The New York Central lines were next, with a reduction of \$5,675,000, while the Louisville & Nashville was third, with a reduction of \$4,005,958.

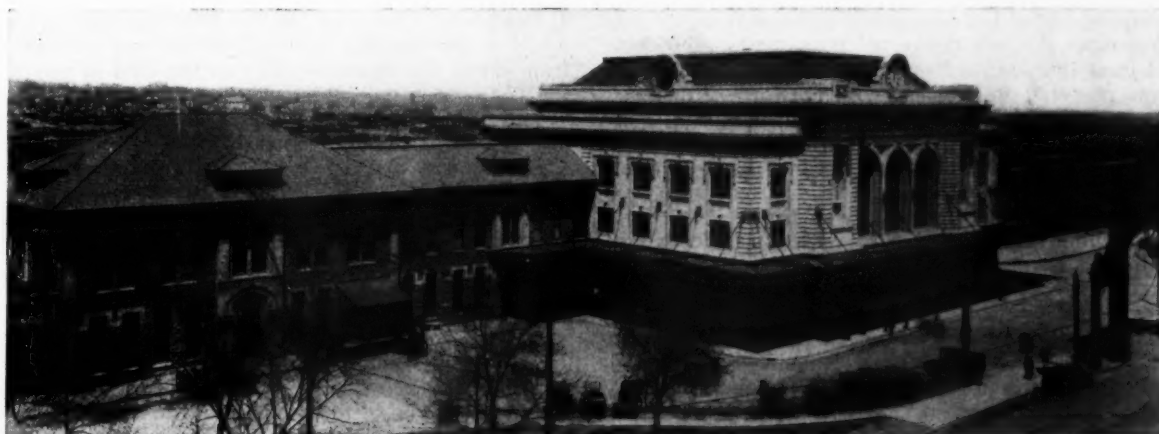


Photo courtesy Denver & Rio Grande Western

The Denver Union Station

# WHAT'S THE ANSWER?

Have you a question you would like to have someone answer?



Have you an answer to any of the questions listed below?

## QUESTIONS TO BE ANSWERED IN THE OCTOBER ISSUE

1. *At what time should the renewal of ties be discontinued for the season? Is it permissible to renew considerable numbers of ties after this date, and if so, under what conditions?*
2. *When necessary to splice piles, how should this be done to obtain the best results?*
3. *When should the work of cleaning out side ditches and shaping them up for the winter be started? What is the best method of doing this work?*
4. *What measures, if any, can be taken to prevent or minimize condensation of moisture and dripping from skylights?*
5. *What are the advantages of burning the right of way, and what special precautions, if any, should be taken during the fall months to prevent grass fires from spreading to adjacent property?*
6. *When should the annual bridge inspection be made, what items should it cover, who should compose the inspection party and what records should be kept?*
7. *When inspection is made in the fall for the next season's tie renewals, how can one determine what ties should be renewed, particularly when a large number of the ties already in the track are treated?*
8. *What special precautions, if any, should be taken to insure that the drainage of sludge from treating plants will be maintained during the winter?*

## Cranes for Work-Train Service

*To what extent can small self-propelled cranes be used to advantage mounted on cars in work-train service? Should they be fixed on one car or move from car to car?*

### Can Be Used to Advantage in Handling Rail

By WILLIAM SHEA

General Roadmaster, Chicago, Milwaukee, St. Paul & Pacific Chicago

Self-propelled cranes can be used to excellent advantage in unloading rail for relay and for picking up the released rail. We formerly used steam cranes or cranes operated by air from the train line for this purpose, but in handling our rail this season, we used American ditchers converted into cranes, employing at least two cranes to each work train. Each crane was mounted on a car between two cars of material, the cranes working to opposite sides of the track. Where the amount of material warranted, additional cranes were used, in multiples of two, in order to cut down the work-train expense by increasing the amount of work done in a given time. The charge for equipment and the wages of the train crew constitute a fixed charge and any economies to be made in their cost must be secured by increasing the amount of work done each day.

As a result of this change in the method of handling the work we have made a saving of \$30 a mile in the cost of unloading and of \$10 a mile in the cost of picking up material. Expressed in terms of percentage of the wages of the machine operators and laborers to the total cost per mile, this amounted to a reduction from 45 per cent to 34 per cent in unloading

and from 39 per cent to 31 per cent in picking up material on approximately 400 miles of track.

An important feature in effecting economies in work-train service is to have plenty of work for the train to perform and then to furnish machines that will do the work quickly and cheaply. At times it is necessary to use work trains for small jobs and on these the cost of assembling labor-saving devices will sometimes overcome the savings to be made by their use.

### Can Be Used for Many Kinds of Work

By C. T. DIKE

Engineer of Maintenance, Chicago & North Western, Chicago

We use self-propelled cranes, rail-laying cranes principally, mounted on cars in work-train service for a number of kinds of work. The decision as to whether they should be fixed on one car or travel from car to car depends solely on the kind of cars in the train.

These cranes are used largely for unloading new rail and for picking up released rail. If the rail is loaded on flat cars, the crane starts at one end of the train and travels from car to car as the unloading proceeds. When the rail is shipped in solid-end gondola cars, the crane is mounted on a car between two cars of rail, and in such cases the full-revolving type of crane is used, although where the crane can travel from car to car, the full-revolving feature is not important. We also use such cranes similarly mounted for unloading or loading bridge timbers and timbers for dock work, as well as other heavy materials within the limits of the capacity of the machine. We have used a crawler-tread crane mounted on a car and equipped with a clamshell bucket for removing the earth from a slide in a cut.

The value of any labor-saving device is enhanced by its ability to keep busy and we are constantly finding new uses for these machines. One of these, while not connected with maintenance of way work, has effected large savings and has been so successful that it has been adopted as a regular procedure. Every fall, during the height of the fruit-shipping season, it is necessary to ice a great many additional refrigerator cars at Chicago for a period of a little over a month. If additional fixed mechanical facilities were installed they would be idle for most of the year, yet the icing of these cars by hand entailed a large expense. A way out was found by loading the ice into drop-end gondola cars which were set on a track between two strings of refrigerator cars. A rail-laying crane mounted on a car at one end of the ice cars loaded the ice into the bunkers of the refrigerator cars on either side, traveling through the string of cars as the ice was unloaded. Since then a full-revolving crane has been used, running on the middle track and switching its own ice cars. These two methods enable us to use either type of crane at a time when they are not ordinarily busy on track work.

## Pointing Old Stone Masonry

*What ingredients, proportions and consistency should be used for mortar for pointing old stone masonry? To what depth should the old mortar be raked out?*

### Use One Part Cement and Two Parts Sand

By F. H. CRAMER

Assistant Bridge Engineer, Chicago, Burlington & Quincy  
Chicago

When pointing old stone masonry, we rake out the joints to a minimum depth of from  $1\frac{1}{2}$  to 2 in., preferably the latter, and use a mortar made of one part of portland cement and from 2 to  $2\frac{1}{2}$  parts of clean, sharp sand, depending on the size of the sand. The consistency should be such that the mortar can be worked back fully into the joint and retain its position without flowing.

After the old mortar has been raked out of the joints to the minimum depth or as much more as is advisable, up to about four inches, depending on the condition of the old mortar, the stone in the open joint should be thoroughly cleaned of dust and of any adhering mortar, especially where lime mortar was used, to insure that the new mortar will have a good bond with the stone. The chisel draft of the stone should also be cleaned with a wire brush. After the cleaning has been done, it should be finished by sluicing out the joint with water, not only to carry out any remaining dust, but also to moisten the stone so that it will not dry out the mortar too rapidly.

It is important to use only clean water with no injurious chemical characteristics and on certain portions of our system, where much of the water is alkaline, it is necessary to haul water for this purpose. If the stream is turbid, but the water is otherwise satisfactory, clear water may be obtained by allowing it to settle in barrels, or by scooping out a hole near the edge of the stream and using the water which filters into it. The sand should be screened through a sieve with 12 wires to the inch.

The mortar is worked back into the joint with the back of the tool that was used for raking out the old mortar. It is applied a little at a time and pressed firmly into place. When the joint is filled, additional

mortar is applied over the joint, extending it to cover part of the surfaces of the stones on either side of the joint, and a half-round bead is formed by the use of a beading tool and straight edge. Only enough mortar should be mixed at a time so that it will be used before the initial set has taken place.

All of the pointing of our old masonry is done under the supervision of one man and in this way uniform results are obtained. We carry on the work all the year and have no trouble with the pointing done in winter. For winter work the materials used in the mortar are heated and the freshly-pointed joints are protected from the weather by canvas, supplemented by salamanders in extremely cold weather.

### Use Equal Parts of Cement and Sand

By F. E. SCHALL

Consulting Bridge Engineer, Lehigh Valley, Bethlehem, Pa.

Our masonry specifications read: "Joints to be raked out to a depth of not less than one inch, cleaned and thoroughly wetted and pointed with neat cement mortar."

I felt that the neat cement requirement was not the proper composition and made inquiries among our practical men as to their practice. They informed me that one part of portland cement and two parts of fine, clean sand is the best proportion, since the clear cement will check and not last as well as the cement and sand mixture. I agree that the cement and sand mixture will give the best results, but prefer a mixture of one part cement and one part sand. The clear cement requirement in our specifications is an inheritance from the old specifications when Rosendale cements were used.

## How Many Jacks for Light Raise?

*What is the maximum number of jacks which can be used to advantage in making a light raise out of face with a gang of from six to eight men? How far apart should the jacks be placed?*

### Four Jacks Should Be the Maximum

By J. MORGAN

Supervisor, Central of Georgia, Leeds, Ala.

In my experience I believe that the best results are obtained by using a maximum of four jacks with a gang of from six to eight men when making a light raise out of face. The jacks should be set one-half rail length apart, at the joints and centers, for all weights of rail from 70 lb. to 90 lb. and for rails from 30 to 39 ft. long. Our 70-lb., 80-lb. and 90-lb. rail is either 33 or 39 ft. long. With these weights and lengths, the placing of the jacks at half rail length intervals holds the rails at the desired level and permits the surfacing of a full rail length before resetting the jacks.

### Depends on Density of Traffic

By ROADMASTER

While four or even six jacks may be used to advantage when making a light raise out of face with a gang of from six to eight men, the number which it is safe to use will depend on the frequency of trains, the distance which approaching trains may be seen and their speed. Six jacks spaced a half-rail length apart will enable the gang to do considerably more work in a given time than when only two are

used, owing to the time saved in setting them, but where the view is obstructed there is a chance that the gang may not be able to remove the jacks before the train reaches them. When more than two jacks are used, the men should be trained thoroughly in just what each is to do in releasing the jacks and getting them out of the way.

## Corrosion of Water Columns

*How can the corrosion of valves or other moving parts at the lower ends of water columns be prevented?*

### Surface Water in Pit Aggravates Condition

By C. R. KNOWLES

Superintendent of Water Service, Illinois Central, Chicago

Inasmuch as the valve box and the lower ends of water columns are located in pits below ground there is a tendency toward excessive corrosion of all parts of the column within the pit. Valves and valve stems are usually constructed of brass or other non-corrodible material, but other moving parts such as locking arms, rollers, springs, etc. necessarily must be constructed of cast iron or steel. Therefore, it is important that they be protected from corrosion.

A more-or-less common practice which somewhat aggravates the corrosion of water-column parts is that of piping waste water from the surface of the ground into the pit. The water columns are in most cases so located that this water passes through cinders before entering the pit and carries quantities of acid resulting from contact with the cinders. This free sulphuric acid increases the tendency toward corrosion of water-column valves and other parts, and surface water should not be permitted to enter the pit where it is possible to avoid it.

Different methods of protecting the various parts of water columns subject to corrosion are painting, oiling and the use of protective coatings, commonly designated as petroleum-jelly compounds. Ordinary paint is of relatively little value in protecting underground portions of water columns on account of the excessive moisture which shortens the life of the paint and makes it extremely difficult to renew it. Heavy bituminastic coatings are more effective but cannot be applied readily to the moving parts. The best protection is the application of a petroleum compound containing rust-inhibiting chemicals, as it will stand up under conditions of extreme moisture and will not interfere with the operation of the moving parts.

### Coat Parts With Rust-Preventing Compound

By J. R. HICKOX

Hydraulic Engineer, Chicago, Burlington & Quincy, Chicago

The conditions surrounding the moving parts referred to are favorable for the formation of rust and on account of their being subjected to so much moisture, it is hard to keep oil or any ordinary coating on them in sufficient quantities to protect them from rust for any great length of time.

One practice has been to clean the parts thoroughly about once a month and coat them with heavy grease. This, of course, requires a great deal of labor during the year, but we have found a product which is made up of a petroleum base containing ingredients which are inhibitors of rust. This has the property of resisting the action of the water and also of

acting as a lubricant so that it is necessary to clean the moving parts only at intervals of from a year to 18 months. One of our men in charge of this work on an entire division says of this preparation: "All the working parts of our cranes on the entire division have been coated as all the parts in a crane pit are subject to rust. I have had to renew the coating on the valve stems only once and have never found any rust or any pitting." This refers to a period extending over a little more than one year.

He finds this same material useful in a number of other ways. Referring to our pumping equipment at a certain station, he says: "The water in this well is very hard on iron and for years we have used wooden rods with galvanized straps and copper pins. In the spring of 1927, upon pulling the rods for renewing the leathers, the iron plunger rod was cleaned thoroughly and coated. The threads on the joints were also coated. In April, 1928, when the old plant was removed and the new one installed, it was necessary to pull the drop and change the single-acting working barrel to a double-acting working barrel. The iron plunger which had been in service for a year still retained a coating and no pitting was discernible. The bolts in the rods were broken loose with a wrench and then turned loose by hand very easily. At the time the new working barrel was placed, all joints of the pipe were cleaned thoroughly with a steel brush and received a coating. In the spring of 1929, it was necessary to pull the drop pipe to do some work in the working barrel and after the joint was loosened with chain tongs, the balance of the pipe was turned off by hand."

This same foreman has used this material on bolts around pumps and when necessary to take off a pump head, the nuts turn off without any interference from rust. The coating has also been used on the threads on tank hoops, which permits the hoops to be tightened even after the tank has been in use for a number of years. I speak of these uses, other than in crane pits, because these parts are subjected to substantially the same source of trouble and everyone in the water service work has these troubles to overcome.

## "Non-Slip" Concrete Platforms

*What steps can be taken to avoid a slippery finish when laying concrete platforms?*

### Depends on Use Made of Platform

By W. E. HART

Manager, Structural and Technical Bureau, Portland Cement Association, Chicago

The method of producing non-slip concrete for station platforms depends upon whether these platforms will be subjected only to foot traffic or to heavy trucking such as occurs on platforms where there is considerable transfer of freight.

For platforms subject to foot traffic, quite satisfactory results can be obtained by sprinkling the surface with a finely ground metallic aggregate produced for this purpose. From  $\frac{1}{4}$  to  $\frac{1}{2}$  lb. of this abrasive material is required for each square foot of the finished surface. The abrasive should be sprinkled after the surface has been troweled and should then be given only a light troweling to embed it in the mortar.

By using wood floats instead of steel trowels to bring the concrete to a smooth, level surface, a non-slip surface is produced. Another method is to "broom" the surface after troweling with a hair or

fiber broom, which creates tiny ridges in the surface, thus giving it non-slip qualities and still leaving it level and smooth.

For station platforms subject to heavy trucking, undoubtedly the most satisfactory results can be obtained by using the coarser metallic aggregates in the mixture itself. These aggregates are aluminum oxide and silicon carbide and come in various sizes. These materials are hard and tough and become well bonded in the concrete. They should be exposed to the surface by grinding, as this removes the film of fine material and exposes the aggregate, thus producing a non-slip surface.

### Finish With Wooden Floats

By ENGINEER OF BUILDINGS

For ordinary concrete platforms, finishing with wooden floats instead of trowels will usually produce a surface which is smooth enough to afford a good footing and still not so smooth as to be slippery. For platforms for large passenger stations where a very smooth surface is desirable on account of appearance, and it is also important to avoid a slippery surface, the platform can be ground down with electric floor grinders to remove the top film of cement and expose the coarse aggregates, or abrasive material may be sprinkled over the surface just before the surface is troweled. The latter method is the cheaper, but grinding gives a somewhat more decorative effect.

## Double Spiking Tie-Plated Track

*What are the advantages and disadvantages of applying the extra spike to the inside of the rail when double spiking on curves where tie plates are used? In such cases should both rails be double spiked?*

### Favors Double Spiking of Both Rails

By G. STAFFORD

Section Foreman, Canadian National, Rosebud, Alta., Canada

On my section, tie plates of two patterns are in use; the "Lundie," latterly installed, and a design where the flange runs lengthwise on the tie. The weight of rail is 60 lb., with a short stretch of 85-lb. section. The maintenance-of-way rules on this road call for the full spiking of the plate, one spike outside and two on the inside of the rail.

One of the most important functions of the tie plates is to hold the rail firmly to gage. Unless the shoulder of the plate is tight to the rail, much of its efficiency in this direction is lost, and when applying tie plates, even if they are pounded on to the tie with a wooden sledge before the tie is pulled into the track, it is difficult to keep the shoulder to the rail unless double-spiked on the inside. By double spiking the inside first, the spikes being struck alternately, the plate will not slew around so that one side of the shoulder is from 1/16 to 1/4 in. away from the rail.

Again, the tendency of the rails to creep on curves, the consequent slewing of the ties, and, in many cases, the tearing away of the plate altogether from the tie can be lessened by double spiking on the inside of the rail. On curves, the creeping action is more noticeable on the high rail, but double-spiking the low rail will help matters considerably by the additional anchorage afforded to the opposite end of the tie.

On curves, the strong lateral pressure of the

wheel flanges against the rail tends to force them out, or to overturn them. Double-spiking on the inside of rails gives added resistance. Fast trains exert pressure against the outer rail, while slow heavy trains bear heavily against the inner rail, therefore it is advisable to double spike both rails.

Furthermore, it is extremely difficult to keep the spikes from drawing out of the tie, thus allowing play between the rail and the plate. If the rail is free to move vertically, even to a small extent, it is hammered by continual blows from the wheels of rolling stock, and after a time becomes indented to the shape of its seat. It is not claimed that double-spiking will entirely overcome this evil, but it lessens it materially. The firmer the rail, plate, and tie are held together, the greater will be the efficiency of the tie plate as a factor in distributing the pressures caused by the loads on the rails, over a larger area of the tie.

The only time I welcome finding the tie plates single spiked on the inside of the curve is when gaging spread track, where plates with flanges running lengthwise with the tie are used, since when the rail is pulled in to normal gage there is an opportunity to drive an additional spike into sound timber instead of into a plugged hole. However, taking everything into consideration, the writer is in favor of double spiking on the inside of rails on curves.

### Extra Spike Should Be on Inside of Rail

By J. MORGAN

Supervisor, Central of Georgia, Leeds, Ala.

Double spiking should be done on curves of 4 deg. or more where softwood ties are used, and the extra spike should be applied to the inside of the rail. There are two advantages in this; the additional spike has greater holding power than if placed on the outside of the rail, because the latter will push back more readily in the fibers of the tie, since the force of the traffic is outward, and this practice also permits the use of old, throat-cut spikes for this purpose, since the resistance is applied to the back of the spike.

The placing of the extra spike on the inside of the rail should be done only where the plates are punched for the size of rail for which they are used and where the spike practically fills the spike hole. Nothing is gained by placing the extra spike on the inside of the rail where the inner spike holes are slotted to permit the use of the plates for different weights or sections of rail. In case such plates are used, the extra spike should be placed on the outside of the rail to obtain any benefit from it. Except for this, there is no disadvantage in placing the extra spike on the inside of the rail.

### Extra Spike Should Be Used on Inside

By W. H. CLEVELAND

General Track Inspector, Atchison, Topeka & Santa Fe, Wellington, Kan.

On curves of 6 deg. or sharper much benefit is gained by applying the third or extra spike to the inside of the rail. The extra spike affords added resistance to the lateral thrust, assisting materially in maintaining uniform gage and decreasing track maintenance by avoiding frequent regaging. It also extends the life of the ties to their ultimate service by eliminating frequent respiking.

The boss or shoulder on the outer side of our tie

plates provides full resistance against the outward thrust, hence the major burden of resistance is thrown on the inside spikes, which also receive abrasion from the motion of the rail on one side and from contact with the tie plate on the opposite side. When the ties have been in service long enough to lose their firmness, the assistance of the extra spike is very noticeable in resisting both lateral thrust and abrasion.

On single track or where heavy grades make it necessary to apply an extra spike to one rail, another should be used on the opposite rail also, as there are noticeable stresses transmitted to both rails, resulting, in some cases, in a longitudinal movement of the tie conforming to the widening of the gage. The addition of the extra spike is well worth the investment.

## Threads for Track Bolts

*What are the relative merits of the U. S. standard rolled and cut threads and Harvey grip threads for track bolts? What are the relative merits of square and hexagonal nuts for track bolts?*

### Rolled Threads are Preferred

By E. D. SWIFT

Engineer Maintenance of Way, Belt Railway of Chicago

Before the introduction of heat-treated track bolts we used the U. S. standard cut thread, but since that time we have changed to the rolled thread and find that they serve the purpose equally well, while they are less expensive. The stem of a bolt with rolled threads has a slightly smaller diameter than that of a bolt with cut threads, and this increased metal in the latter type of bolt was of value in bolts which were not heat-treated. With heat treatment, which has increased the resistance of the metal to stretch, this additional metal in the bolts with cut threads has lost much of its importance and the bolts with rolled threads give satisfactory service.

We now use only square nuts for track bolts and prefer them on account of the better hold they afford for the track wrench. Hexagonal nuts have a tendency to wear away at the corners from the action of the wrench, permitting it to slip when the bolts are being tightened.

### Rolled Threads are Satisfactory

By C. W. BREED

Engineer of Standards, Chicago, Burlington & Quincy, Chicago

U. S. standard rolled threads are satisfactory for track bolts if the threads of the nut are cut to the same standard. If this feature is not insisted upon in the manufacture of the nuts, the nut sometimes will tighten on the bolt so that it cannot be turned before it has engaged the angle bar.

In order to obviate this trouble, our specifications require that the threads on both the bolts and nuts shall be U. S. standard and that the number of threads per inch on each shall conform exactly to that standard. The specifications also require that the nuts shall have a hand-free fit on the bolts of from two to six turns, and shall be wrench-tight the rest of the screw-length without distorting the thread or twisting the shank, with the further provision that they shall show a minimum resistance of 20 lb. and a maximum resistance of 70 lb., applied to the end

of a 24-in. wrench. Another change in the specifications provides that under no circumstances shall the nuts rattle when the end of the bolt is two threads through the nut. With these provisions there is no trouble in keeping the bolts tight to the angle bar and the labor of tightening bolts is reduced materially.

While we formerly used both square and hexagonal nuts for track bolts, we now use only the former. The hexagonal nut introduces hazards by reason of the greater tendency of the wrench to slip off when it is being tightened and this is aggravated by the wear at the angles after a nut has been tightened a number of times.

## Fire Protection on New Creosoted Bridge Decks

*When freshly creosoted timbers are placed in a bridge deck, what measures can be taken to reduce the fire hazard?*

### A Sprinkling of Dry Sand Is Effective

By HUNTER McDONALD

Chief Engineer, Nashville, Chattanooga & St. Louis, Nashville, Tenn.

It is our custom, when applying ballast decks to steel bridges or trestle work, to sprinkle dry sand over the top surfaces of freshly creosoted timber. Where creosoted framed bridge ties are used, which is rare, the tops of such timbers are watched from time to time and exudations of oil or tar due to the hot sun are kept sprinkled with sand.

In applying ballast decks to trestles the danger is removed as soon as the ballast is applied, except in the case of freshly creosoted track ties embedded in the ballast. These are sprinkled with sand from time to time as required. We have had no fires from this cause.

### Not Sure Protection Is Needed

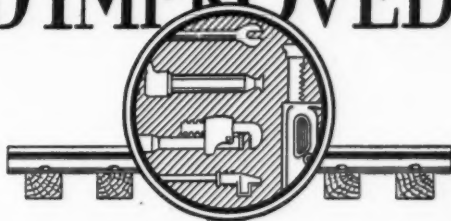
By L. H. BOND

Engineer Maintenance of Way, Illinois Central, Chicago

While we have used open-deck trestles of creosoted timber as standard for only a short time, we have had some such trestles on various parts of our system for a number of years and never had any trouble with fire starting in the deck. In the light of this experience, we are providing no special means of protecting the decks of the new trestles from fire.

These are watched carefully and should the need of protection develop it is likely that we would use a covering of sheet metal. While the life of such a covering would be only a few years, it would be long enough to furnish protection until the oil had a chance to dry out, after which time the fire hazard in creosoted timber is no greater, if as great, as in untreated lumber. I may add that we do not use the open-deck trestles on our important lines, so that they are not exposed to the same chances of fire as they would be on such lines, and, in case of a fire, the interruption to service is not so serious. In this matter, we are trying to ascertain the relative economies of protection and lack of protection, based on further experience with the creosoted open-deck trestles. In our ballast-deck trestles, which are built of creosoted timber, the ballast, of course, furnishes protection to the deck.

# NEW AND IMPROVED DEVICES



## New Northwest Shovel

**T**HE Northwest Engineering Company has developed and placed on the market a crawler-tread  $1\frac{1}{2}$ -cu. yd. shovel which embodies, for the first time, in a shovel of this capacity, Northwest features which have been used in the smaller machines. The



The Northwest Model 6 Shovel in Action

shovel, which is known as Model 6, is convertible into a 19-ton crane, a  $1\frac{1}{2}$ -cu. yd. dragline, and a 49-59-in. trench-pull shovel.

In this shovel, positive traction is maintained in both crawlers while turning as well as while going straight ahead. The clutches are thrown by the power of the engine, actuated by a "feather-touch"

control. The main drive from the engine is through helical cut-steel gears in an oil bath and running on ball and roller bearings, while all high-speed shafts are mounted on ball bearings, to assure easy running and quick response to the control.

If desired, this machine can be equipped with the Northwest variable-speed, accelerator-controlled motor instead of the regular governor-controlled motor. As a shovel, it can be furnished with either the standard or the "close-quarter" crowd, in which there is no division in engine power between the hoist and the thrust. In spite of the large capacity of this machine, it can be shipped to practically any part of the country on one flat car without being dismantled.

## Fairmont Develops Attachment For Burning Greater Width

**E**XTENSION arms, to burn vegetation outside the regular 18-ft. spread, in ditches, up the sides of cuts and on the slopes of embankments, have been developed by Fairmont Railway Motors, Inc., for use on each side of its M 27 weed burner. When in use, either of the arms can be swung quickly in or out and raised or lowered, independently of the other, while the machine is in motion. Two operators on the rear deck easily control the extensions, by means of hand wheels, while attending to the remaining burners and regulating the wings.

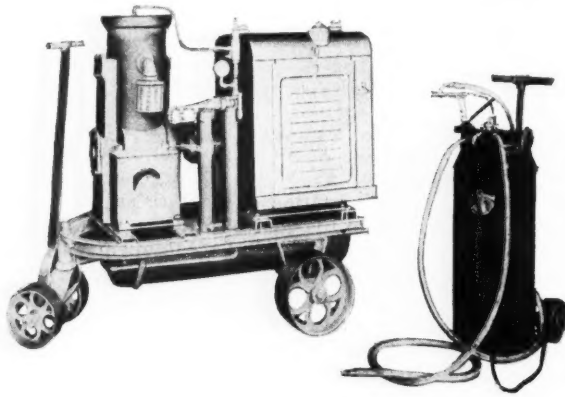
Each of the arms is constantly adjustable through an arc of 90 deg. to any desired angle or height. The maximum reach of the flame is 40 ft. over all, but still longer pipes for wider burning can be furnished when desired. Any one of the six or eight burners on the machine can be extinguished instantly, or started again while hot, by means of individual control valves, thus saving fuel where sections of the track are clear of weeds. All of the burners can also be shut off or started simultaneously from the pilot seat.



Fairmont Extension Burners Reach Side Ditches and Slopes of Embankments

## A New Spray Painting Unit

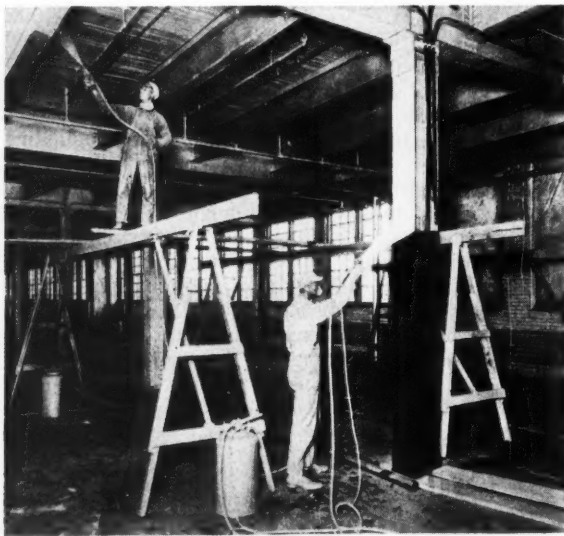
A PORTABLE, gasoline-engine-driven, air-painting unit, recently placed on the market by the Paasche Airbrush Company, Chicago, is now being introduced in railroad service for general maintenance painting of all kinds. Indicative of the work that it will do, five buildings were painted with this



The New Portable Unit

equipment in 8 hours which formerly required two hand brush operators 24 hours to paint.

The Paasche air-painting unit illustrated, comprises a Worthington hopper cooled, feather valve air compressor, designed for high efficiency and low maintenance, driven by a direct-connected Novo six-horse power, two-cycle, gasoline engine. This engine is radiator cooled and provided with magneto



Painting a Shop with Paasche Equipment

ignition, roller bearings and force-feed lubrication. Both the air compressor and engine are mounted on a reinforced channel-iron chassis provided with four wide-flange wheels to permit the unit to be moved readily over soft ground, if necessary. An air tank or reservoir, 9 in. by 44 in., is supported beneath the chassis. Other equipment on the chassis includes a clean air intake filter, an automatic unloader and a patented 32-ft. water and oil separator with gages and fittings.

The Paasche air-painting unit also includes one or

more pressure feed tanks of seamless drawn steel with a patented, quick, clamp-tight, nine-inch cover, a three-way inlet valve and an air regulator. The line pressure can be adjusted to any required amount to atomize ordinary paints or heavy materials such as cement wash, alphaltum, etc.

The air gun is made of strong, yet light material, being of standard construction with all parts and threads fully enclosed and interchangeable. The material inlet swivel may be connected from the top or bottom of the air gun to facilitate easy handling under all working conditions. The two-finger trigger and a stainless-steel needle control the flow of paint, eliminating waste. This needle seals the fluid feed opening air-tight so that the paint or material that does not settle quickly may be left in the hose without clogging. The Paasche air-painting equipment can also be used for light sand blasting.

## Crossing Gates Are Operated By Overhead Cable System

CABLE-OPERATED crossing gates, in which no cables are carried underground, have been developed by the Chicago Rapid Transit Lines and a test installation is now in service at the crossing of Sacramento avenue on their Ravenswood branch. The crossing consists of four Buda gates mounted on Bates steel



The Gates at Sacramento Avenue

poles 22½ ft. high, the two posts on one side of the street being joined at their tops by a steel beam or strut spanning across the tracks. Pulleys are provided on the tops of the posts to carry the ¾-in. cables for the operation of the gates from the operating house, thus obviating the need for conduits to carry any parts of the cables underground.

The gates on the two sides of the track are operated independently of each other, there being a separate lever for the control of each pair of gates. The control is such that the gate arms may be stopped at any point in the movement from full open to completely closed. Furthermore, the elimination of underground runs of the cables removes the hazard of failure of operation on account of freezing and decreases the expense of maintenance.

STOCK KILLED ON TRACKS.—It is estimated that the livestock killed on the tracks of the Central of Georgia during 1928 would fill 60 stock cars.

## New Books

**A. R. E. A. Trackwork Plans.** Portfolio, 9½ by 13 in. Bound in leather for loose-leaf insertion. Published by the Manganese Track Society, New York City. Price, \$10, refills, \$8.

The portfolio of track plans which has just been issued by the Manganese Track Society constitutes an outstanding achievement in the field of railway engineering association work. This book, which was first issued about 10 years ago, and which has been revised from time to time by means of loose-leaf inserts, in this edition has been completely revised and brought up to date to include such plans as were adopted at the 1929 convention, so that it constitutes a complete set of the standard track plans and specifications of the American Railway Engineering Association.

While the size makes it handy for desk use, all of the details and dimensions which were shown on the original drawings of the track committee are clearly legible. Copies of either the complete book or the refills only can be secured from J. B. Strong, chairman, Manganese Track Society, or E. H. Fritch, secretary, American Railway Engineering Association, 431 S. Dearborn St., Chicago.

**Railway Engineering and Maintenance Cyclopedia.** 1116 pages, 2500 illustrations, 9 by 12 in. Bound in leather and cloth. Published by the Simmons-Boardman Publishing Company, New York City. Price, cloth, \$5, leather, \$7.

This volume is the third edition of the *Railway Engineering and Maintenance Cyclopedia*, which was first issued in 1921 as the *Maintenance of Way Cyclopedia* and followed by a second edition in 1926. It has been materially revised and enlarged, more than half of the text having been rewritten to conform to changes in materials and methods. In addition to the new material and the revisions of the text, nearly 1,000 new illustrations have been used to supplement the text and show the latest applications of materials and equipment. Although the book has been thoroughly revised, the major subdivisions of definitions and text, as well as the arrangement of correlated matter into chapters and sections, which received widespread approval in the second edition, have been retained.

As in previous editions, the revision of the data contained in the book has been in the hands of experienced railway men, and every effort has been made to assure that the information is entirely accurate and up to date. The editorial staff was composed of Elmer T. Howson, editor (editor of *Railway Engineering and Maintenance*), W. F. Rench, managing editor (formerly supervisor, Pennsylvania System), and George E. Boyd, associate editor (formerly division engineer Delaware, Lackawanna & Western), assisted by Philip George Lang, Jr., bridge engineer, Baltimore & Ohio, who prepared the manuscript for the bridge section; Arthur L. Sparks, architect, Missouri-Kansas-Texas, for the building section; C. R. Knowles, superintendent of water service, Illinois Central, for the water service section; and A. H. McKeen, signal engineer, Union Pacific System, for the signal section.

The Cyclopedia has definitely established itself as a standard work of reference in the field of railway engineering and maintenance, not only for maintenance officers, but for operating and executive officers as well. Its value in this respect is recognized by the American Railway Engineering Association and the Signal Section of the American Railway Association, both of which

organizations appointed committees to co-operate with the editors in its preparation.

The book opens with a definition section of 92 pages, which provides brief, but complete, definitions of more than 3,000 words and terms, with frequent reference to their railway applications. This section has been enlarged about 40 per cent, and should be useful to the busy railway officer, since these definitions have been collected from widely scattered sources. By means of cross references to the more detailed discussions, this section also becomes a subject index to the text section.

In the text pages, methods, materials and products are described tersely, special emphasis being given to the recent developments in methods of doing work and the diverse applications of labor-saving machinery and other equipment and materials. This treatment is followed in close sequence, in many cases, by more specific and detailed discussion of their individual characteristics, by the manufacturers of such products or by those concerns which furnish a particular service. Specifications which have been adopted by the A. R. E. A., the Signal Section of the A. R. A. and the American Wood Preservers' Association have been used freely to illustrate in detail the current recommended or standard practice of these associations.

In the track section, a rearrangement of the text enables the entire discussion of small tools to be contained in one chapter. A similar rearrangement combines turntables and transfer tables in one chapter in the bridge section. In the building section, new chapters have been introduced to permit more complete discussion of icing stations, locomotive terminal and shop layouts, standardized buildings, and facilities for housing employees. In the water service section, while the chapter headings remain the same, there has been considerable rearrangement of material to permit a better discussion of recent developments in this field. Because of the greater rapidity of developments in the signal field, this section has been almost entirely rewritten and several new chapters inserted. The general section has been considerably enlarged, although one chapter, that relating to labor camps, has been transferred to another section.

As an indication of the scope and character of the book, which contains more than 100 chapters, the text, following the definition section, is divided into six sections covering the construction and maintenance of tracks and roadway, bridges, buildings, water service and signals, while the last or general section discusses such subjects as are closely related to two or more of the special departments of maintenance. Typical of the broad range of subjects treated, the track section is divided into the following chapters: Roadway Standards, Grading and Grading Equipment, Drainage and Ditching Equipment, Snow and Ice Removal, Weed Destroyers, Ballast, Ballast Application and Cleaning, Ties, Rail, Rail Renewal and Maintenance, Rail Joints and Fastenings, Rail Joint Accessories, Tie Plates, Anti-Creepers, Switches, Frogs and Crossings, Guard Rails, Switch Stands, Derails, Bumpers and Car Stops, Fencing, Highway Crossings, Signs, Motor, Hand and Push Cars and Miscellaneous Tools and Equipment.

This book should prove a valuable aid to the railway maintenance officer who desires to keep informed regarding the equipment and materials available to meet a particular problem; to the operating or executive officer who must pass on the recommendations of his assistants; to the purchasing officer, who must keep himself fully informed regarding the wide diversity of materials available for use; as well as the supervisor or foreman who must use these materials.

## WITH THE ASSOCIATIONS



### Wood Preservers Association

A meeting of the Executive Committee has been called in Chicago on September 13 to review the work of the association and in particular to formulate plans for the next annual convention which will be held in Seattle, Wash., on January 28-30.

### Bridge and Building Association

Three of the eight reports of standing committees are now completed and in the hands of the secretary, while the others are promised by August 1.

### American Railway Engineering Association

A new Manual, the first to be published since 1921, is now being assembled and it is expected that it will be ready for distribution to the members some time in September. This 1929 edition will be fully one third larger than the 1921 Manual.

Five committees held meetings in July. The Committee on Track held a meeting at White Sulphur Springs, W. Va., on July 15 and 16 with 18 members present. The Committee on Iron and Steel Structures met at Detroit on July 18 and 19, and the Committee on Records and Accounts at the same place on July 25. The Committee on Economics of Railway Labor met at Chicago on July 23 while the Special Committee on Stresses in Track met at Chicago on July 31.

At least ten members of the association will attend the World's Engineering Congress to be held at Tokio, Japan, from October 29 to Nov. 7. Louis Yager, president of the association, will be the official delegate but all of the others will be designated as alternates. In addition to Mr. Yager, those attending will include Secretary E. H. Fritch, J. M. R. Fairbairn, chief engineer, Canadian Pacific; F. T. Darrow, assistant chief engineer, Chicago, Burlington & Quincy; George Gibbs, chief engineer electric traction, Long Island; Ralph Modjeski and Francis Lee Stuart, consulting engineers; Professor A. N. Talbot of the University of Illinois and Professor W. K. Hatt of Purdue University. The party from the United States will sail from San Francisco on October 10 and after attending the Congress and going on various tours will start the return trip on November 14.

Secretary Fritch will leave for the Orient in advance of the regular delegates from the United States so as to return in time to supervise the publication of the committee reports late in the fall. He will leave Chicago on September 15, sail from Vancouver, B. C., on September 19 and arrive in Japan in ample season to make a tour of the islands before the congress convenes. He expects to be back in his office on November 21.

### Roadmasters Association

At a meeting of the Executive Committee in Chicago on July 13 the reports of the five standing committees were reviewed and returned to the chairmen for minor modification and early completion and re-submission to the secretary by August 1. At this meeting the program for the convention next month was formulated, including, in addition to the reports of the five committees, addresses by six men of prominence in the railway field.

In addition to the regular sessions, it is planned to

present an evening of track work in moving pictures on Tuesday evening, depicting new materials and methods for expediting maintenance operations. Following the conclusion of the convention on Thursday noon, September 19, the party will visit the plant of the Inland Steel Company at Indiana Harbor, Ind., where opportunity will be afforded those present to see the rolling of rails and tie plates and the production of other track materials.

### The Track Supply Association

Although six weeks remain before the Track Supply Association will present its exhibit in connection with the convention of the Roadmasters' and Maintenance of Way Association at the Stevens Hotel on September 17-19, 64 firms have taken membership and made reservations for 76 spaces, assuring that the exhibit will be the largest and most complete in the history of this organization. Those firms which have taken membership in the association to date are as follows:

Air Reduction Sales Company  
American Chain Company, Inc.  
The American Fork & Hoe Company  
American Hoist & Derrick Company  
American Valve & Meter Company  
American Steel & Wire Company  
Balkwill Manganese Crossing Company  
Bethlehem Steel Company  
The Buda Company  
The Philip Carey Company  
Chicago Pneumatic Tool Company  
Chipman Chemical Engineering Company, Inc.  
Creepcheck Company, Inc.  
Crerar Adams & Company  
Cullen-Friestedt Company  
Duff-Norton Manufacturing Company  
Thomas A. Edison, Inc.  
Electric Tamper & Equipment Company  
Fairbanks, Morse & Company  
Fairmont Railway Motors, Inc.  
Hayes Track Appliance Company  
Hayward Company  
Hubbard and Company  
Ingersoll-Rand Company  
Industrial Brownhoist Corporation  
O. F. Jordon Company  
K. & W. Equipment Company  
Kalamazoo Railway Supply Company  
Keystone Grinder & Manufacturing Company  
Lundie Engineering Corporation  
Maintenance Equipment Company  
Mechanical Manufacturing Company  
National Lock Washer Company  
National Malleable & Steel Castings Company  
Nordberg Manufacturing Company  
Northwestern Motor Company  
Oxweld Railroad Service Company  
Pocket List of Railroad Officials  
P. & M. Company  
Pettibone Mulliken Company  
Positive Rail Anchor Company  
Q. & C. Company  
Rail Joint Company  
Railway Engineering and Maintenance  
Railroad Supply Company  
Ramapo Ajax Corporation  
Railway Maintenance Corporation  
Railway Purchases and Stores  
Reed Manufacturing Company  
Reliance Manufacturing Corporation  
Sellers Manufacturing Company  
Skelton Shovel Company, Inc.  
St. Louis Frog and Switch Company  
Standard Oil Company  
Syntrol Company  
Templeton, Kenly & Company, Ltd.  
Union Switch & Signal Company  
U. S. Graphite Company  
Verona Tool Works  
Western Wheeled Scraper Company  
Wm. Wharton, Jr., & Co., Inc.  
Wooding Forge & Tool Company  
Woolery Machine Company  
Warren Tool & Forge Company

# RAILWAY NEWS



# BRIEFLY TOLD

Thousands of fish in Wallace river in Nova Scotia were poisoned as the result of the bursting of a drum of creosote in a derailment near Amherst. The contents of the drum were spilled into a small stream which carried them into the river, killing trout, salmon and eels, whose dead bodies lay along the banks for three or four miles.

While the railways have been handling heavy traffic during the last few years, M. O. Lorenz, director of the Bureau of Statistics of the Interstate Commerce Commission, in a recent report, shows that the rate of growth has been diminishing. Traffic increased 100 per cent from 1900 to 1914, while from 1914 to 1928, the increase was only 50 per cent.

Construction work on the Hudson Bay Railway has been delayed by the necessity of using the forces to fight bush fires and also by the difficulty in obtaining material from frozen deposits of sand and gravel. As a consequence, the completion of the line for the operation of passenger trains is not expected before November 1, and the ceremony of driving the golden spike will probably be held in the spring of 1930.

A judgment of \$1,007,000 has been awarded the Southern Pacific by the United States Court of Claims for its services in preventing a flood in the Imperial Valley of California in 1907, in response to a request by President Roosevelt for co-operation in closing a break in the bank of the Colorado River. The railroad's original claim was for \$1,200,000, while the government contended the compensation should be \$867,000.

The Atchison, Topeka & Santa Fe and the Panhandle & Santa Fe have leased the properties of the Kansas City, Mexico & Orient and the Kansas City, Mexico & Orient of Texas, extending from Wichita, Kan., to Alpine, Tex., 735 miles. The line from Wichita to Altus, Okla., will be operated as a part of the Panhandle division of the former road, while the Panhandle & Santa Fe will operate the line from Altus to Alpine as a part of its Slaton division.

Of 835 "Certificate of Merit" cards issued at the close of 1928 to foremen in the various departments of the Chesapeake & Ohio who had been successful in preventing personal injuries to the workmen in their charge during that year, 447 were awarded to maintenance of way foremen. The practice of issuing these cards was inaugurated

in 1924, and of 100 foremen who have clear records for the entire five-year period, 80 are in the maintenance of way department.

The Union Pacific, from December 20, 1925, to March 1, 1929, handled 11,108 eastbound trains of perishable freight, every one of which made schedule time or better. This road also handles annually several hundred thousand carloads of high-class freight, aside from perishable commodities, and an indication of the regularity with which its traffic is moved is shown by the fact that during 1928, an average of only one car out of every 11,500 cars handled was delayed over 48 hours.

The Committee on Grade Crossings and Highway Intersections of the National Conference on Street and Highway Safety announces that it will undertake a comprehensive investigation during the coming months of the causes of and remedies for the large number of accidents at grade crossings and highway intersections. Four sub-committees have been named to consider the following topics: Protective measures as shown by statistics; methods for the reduction of physical hazards; signs, signals and other protective devices, and uniform rules of the road. Secretary Lamont of the Department of Commerce has been assured of the

co-operation of the national conference in this problem and it is hoped that its efforts will result in the adoption of practical measures.

The Wabash, in an application to the Interstate Commerce Commission for authority to form a new Eastern trunk line by the acquisition or merger of various roads, with the Wabash as the nucleus, also asks that the commission provide for a six-system grouping of the Eastern roads in the consolidation plan which it is expected to promulgate. The principal roads included in the Wabash plan are the Lehigh Valley, the Wheeling & Lake Erie, the Pittsburgh & West Virginia, and the Western Maryland.

Grain loading in the Southwest broke all previous records for the latter part of June and the early part of July, owing to the early ripening of the crop, the increase in the number of "combine" threshers and an increased market price, which caused the movement of a considerable quantity of old wheat at the same time. Despite the heavy movement of grain, there were few delays in handling it except those caused by shortage of ocean shipping at Galveston, Tex., which caused an embargo to be placed at that point until the grain could be unloaded from waiting cars.

A co-ordinated railway and air service was inaugurated on July 8 by the Pennsylvania, the Atchison, Topeka & Santa Fe and the Transcontinental Air Transport which enables passengers to travel between New York and Los Angeles, Cal., in a little less than 48 hours. Leaving New York on the Pennsylvania at 6:05 p. m., the passengers arrive at Port Columbus, seven miles east of Columbus, Ohio, at 7:55, and transfer to an airplane which travels via Indianapolis, Ind., St. Louis, Mo., Kansas City, and Wichita, Kan., and arrives at a landing field near Waynoka, Okla., at 6:24 p. m. The passengers board a waiting sleeping car which arrives at Clovis, N. M., at 8:25 a. m., and after breakfasting in the Harvey House at that place, are taken to a nearby airport where they embark on an airplane which arrives at Los Angeles at 5:52 p. m. Eastbound passengers leave Los Angeles at 8:45 a. m. and arrive at New York at 9:05 the second morning. Ford tri-motored planes are used in this service and Fred Harvey lunches are served during the flights. While the planes are designed to carry 15 passengers, the number is restricted to 10 to afford a maximum of safety.

## Railway Traffic at Record Level

Railway traffic and earnings are now on a higher level than ever before. The net operating income of the Class I roads for the first five months of the current year exceeded all previous records for corresponding periods, amounting to \$457,362,038 or 21.6 per cent above that of 1928. Revenue freight car loadings for the first 26 weeks of 1929 were likewise greater than those for the first half of any preceding year, totaling 25,596,938 cars or 4.5 per cent more than in the corresponding period last year. That this condition will continue during the third quarter of 1929 is indicated by the forecast of the regional shippers' advisory boards, which estimates that the loadings of the 29 principal commodities will be 7 per cent greater than in the corresponding quarter in 1928.

## Construction News

The Algoma Eastern has awarded a contract for the construction of an extension to the coal dock and storage facilities at Turner, Ont., to the Ralph MacDonald Paving Company at a cost of \$150,000.

The Atchison, Topeka & Santa Fe has let a contract to the Lone Star Construction Company, San Antonio, Tex., for the construction of an extension of the Kansas City, Mexico & Orient from San Angelo, Tex., to Sonora, 65 miles.

The Baltimore & Ohio has awarded a contract to the Vang Construction Company, Cumberland, Md., for grading work on its lines at Loveland, Ohio, estimated to cost about \$100,000.

The Bangor & Aroostook has authorized a number of construction projects on its lines which are estimated to involve a total expenditure of approximately \$254,000, as follows: Replacing six existing bridges with similar structures of a heavier type between West Seebois and Houlton, Me., \$66,000; re-location of  $\frac{3}{4}$  mile of track, including a new bridge over the west branch of the Penobscot River, five miles south of Millinocket, Me., \$110,000; construction of 100-ft. turntables at Millinocket and at Houlton, \$60,000; extensions to three side tracks and the building of one new side track and wye track, \$18,415. A contract for steel work on the bridges and for the erection of the two turntables has been awarded to the Bethlehem Steel Company. The remainder will be done with company forces.

The Bessemer & Lake Erie has authorized construction work involving an estimated expenditure of \$75,750, including the replacing of a 252 ft. single track through truss span bridge on its northbound track at Greenville, Pa.

The Bijou Hills & Eastern has made plans for the construction of a railway between Bijou Hills, S. D., and Mitchell calling for the construction of 85 miles of line in Brule, Aurora and Davison Counties.

The Boston & Maine has submitted alternate plans to the New York Public Service Commission for the elimination of four grade crossings on its lines in the village of Scotia, N. Y., one to provide overcrossings for two of the highways and a bridge to care for the traffic of the other two, at an estimated cost of \$348,000. The second plan provides for the depression of the tracks, thereby reducing the height of the approaches to the overpasses, at an estimated cost of \$492,000.

This company plans to replace an enginehouse at West Springfield, Mass., by an 18-stall enginehouse, at an estimated cost of \$560,000.

A final contract covering the design and construction of a 16-story, 500-room hotel in connection with the New North Station project, at Boston, Mass., by this company and the Man-

ger Hotel interests of New York, was announced on July 15, subject to the final approval by the Massachusetts Department of Public Utilities. The cost will be approximately \$2,800,000.

Contracts have been awarded to the Roberts & Schaefer Company, Chicago, for a 2,000-ton, six-track coaling and sanding station at Boston, Mass., and for a 500-ton, three-track shallow-pit coaling and sanding plant at Worcester, Mass.

The Canadian National and The Canadian Pacific have let the general contract for the construction of a concrete subway, 1,300 ft. long, under the tracks of these companies on Ray Avenue, Toronto, Ont., to the Dufferin Paving & Crushed Stone Company, Toronto, at a cost of about \$145,000.

The Canadian Pacific has let a contract for the demolition of the hotel at Balfour, B. C., on Kootenay Lake, which was built in 1910 at a cost of \$250,000 and used from 1917 to 1925 as a tuberculosis sanatorium for returned soldiers.

A contract has been let to Foley Brothers, Ltd., Winnipeg, Man., for the grading of the first 45 miles of the line to be constructed between Lanigan, Sask., and Prince Albert. The contract for grading the second half of the line from M. P. 45 to M. P. 91 at Birch Hills, Sask., near Prince Albert, has been let to Stewart & Cameron, Winnipeg.

The Chesapeake & Ohio has awarded a contract to the West Virginia Construction Company, Huntington, W. Va., for the construction of an undergrade crossing in St. Albans, W. Va., to cost approximately \$110,000. A contract also has been let to Board & Board, Charleston, W. Va., for the construction of an undergrade crossing at

Miami, O., at an estimated expenditure of \$112,500.

A contract has been awarded to Joseph E. Nelson & Sons, Chicago, for the construction of an oil house, power plant and coachwheel drop pit at Richmond, Va., to cost approximately \$85,000.

The Chicago & North Western has let a contract to the Roberts & Schaefer Company, Chicago, for the installation of a multiple-track cinder plant at Council Bluffs, Iowa.

The Chicago, Burlington & Quincy has awarded a contract to the James Stewart Corporation, Chicago, for the construction of a reinforced concrete grain elevator at St. Louis, Mo., which will have a capacity of 1,250,000 bu. and will involve an expenditure of about \$500,000.

The Chicago, Milwaukee, St. Paul & Pacific has let a contract for the construction of an addition to the car repair facilities at the West Milwaukee shops, Milwaukee, Wis., to the Foundation Company, New York. The addition will have dimensions of 200 ft. by 1,000 ft.

A contract has been let to John Marsch, Chicago, for the construction of a double track cut-off at Sioux City, Iowa, between the passenger station in that city and a point on the present main line near Brughier Bridge, 2.5 miles. The new line will be constructed through an undeveloped section, where it will be unnecessary to cross any streets or highways. The old main line crossed 16 streets at grade and included a 1 per cent grade. The project involves the excavation of about 100,000 cu. yds. of earth and the expenditure of \$150,000.

The Cincinnati Union Terminal has invited 11 contractors to submit bids for the grading for the site for the new terminal project in the Mill Creek bottoms at Cincinnati, O. This work involves the placing of about 6,000,000 cubic yards of earth.

The Cleveland, Cincinnati, Chicago & St. Louis has awarded contracts for the construction of second main track and the reduction of grades on 40 miles of line in Indiana, involving about 1,800,000 cu. yd. of grading. A contract has been awarded to the Nelson and Chase & Gilbert Company, Chicago, for about 100,000 cu. yd. of grading and the placing of 1,850 cu. yd. of masonry for the construction of second main track between Mounds, Ind., and Williams Yard, 10 miles, two stations between Anderson and Muncie. When this project is completed the entire Cleveland and Indianapolis divisions, between Cleveland, Ohio, and Indianapolis, Ind., will be provided with double track. Two contracts have been let to the Walsh Construction Company, Davenport, Iowa, one of which involves the double-tracking of 22 miles of line on the Chicago division between Whites-town, Ind., and Colfax and includes approximately 600,000 cu. yd. of grading and the placing of 5,000 cu. yd. of

### Construction Is Active Many Contracts Let

Railway construction was authorized, placed under contract or announced to an aggregate amount of more than \$400,000,000 during July, indicating unusual activity during the remainder of the year. Among the larger projects, the New York Central completed negotiations with the city of New York for improvements involving the expenditure of more than \$175,000,000, while the Pennsylvania completed similar negotiations preliminary to spending \$22,000,000 in Baltimore. Contracts were let during the month for the construction of more than 85 miles of new lines and for more than 60 miles of second track in the United States and for more than 90 miles of new lines in Canada, while the amount of other work authorized was in excess of \$205,000,000.

concrete. The other contract awarded to the same company includes 1,100,000 cu. yd. of grading and the placing of 13,000 cu. yd. of concrete for the construction of double track and the reduction of grades between Terre Haute, Ind., and Sanford, 8 miles.

The Erie has awarded a contract to Senior & Palmer, New York, for work in connection with the reconstruction of its shops at Susquehanna, Pa., the cost of which, together with equipment, was estimated at \$378,000 in the company's 1929 budget.

The Great Northern has awarded a contract for the construction of an eight-stall brick addition to the roundhouse at Havre, Mont., to the Industrial Contracting Company, St. Paul, Minn. The total cost of this project, including a 120-ft. turntable, will be about \$125,000.

The Hocking Valley has let a contract for the installation of two electric car dumpers at the new Presque Isle terminal at Toledo, Ohio, to the Industrial Brown Hoist Corporation, Cleveland, Ohio. A contract for the construction of three Hulett stiff-leg ore unloaders at the same point has been awarded to the Wellman-Seaver-Morgan Company, Cleveland.

The Illinois Central will use company forces in the rearrangement of tracks serving mechanical facilities, the enlargement of yards and the rearrangement of the mechanical storehouse and mechanical office force facilities at Monroe, La., at a cost of about \$250,000. It is planned to construct by contract a new passenger station at that point at a cost of about \$100,000.

The Kansas City Southern has been authorized by the War Department to construct a bridge over the Missouri River at a point 1.5 miles east of Randolph, Mo.

The Louisville & Nashville has let a contract for the construction of a 10-story addition to its office building at Louisville, Ky., to the United Engineers & Constructors, Inc., New York. The estimated cost of the project is about \$750,000.

The Mayo & Cook's Hammock has been authorized by the Interstate Commerce Commission to construct a line from Mayo, Fla., to Cook's Hammock, 13 miles, at an estimated cost of \$200,000.

The Minneapolis, St. Paul & Sault Ste. Marie has awarded a contract to the Roberts & Schaefer Company, Chicago, for a 125-ton coaling plant and an "N. & W." cinder plant at Irvine, Wis.

The Missouri-Kansas-Texas has completed plans for the construction of an extension of the freight yards at Kansas City, Mo., to provide about five miles of additional trackage for 700 cars. With the construction of an addition to the freight station and team tracks, the total cost of the improvements will be about \$1,000,000.

The Missouri Pacific has authorized the construction of a second main track

between Eureka, Mo., and Lake Hill, 10.4 miles, as a part of its program of double tracking on the main line between Kansas City, Mo., and St. Louis. The total cost of this work is estimated at more than \$4,350,000.

The New York Central is preparing plans and specifications for the elimination of a highway grade crossing at Schuyler Street on its lines in Utica, N. Y., which is estimated to cost about \$300,000.

The Interstate Commerce Commission has authorized this company to construct a cut-off on its Putnam division in Westchester county, New York, extending from a point about a mile south of Briarcliff Manor to about one-quarter mile south of East View, 4.6 miles, and upon the completion of this line to abandon the existing line, 6 miles, between these points. The property involved in the line change is owned by John D. Rockefeller, Jr., James Stillman and the Briarcliff Realty Company, who will donate the necessary right-of-way, and Mr. Rockefeller will contribute two-thirds of the cost of construction of the new line, the estimated cost of which is \$1,192,000.

The final contract between the railroad company and the city for the carrying out of the \$175,000,000 West Side improvement plan in Manhattan was signed on July 5. The plan calls for the elimination of all grade crossings on the island from St. John Park (Beach Street) to Spuyten Duyvil, the removal of tracks from Eleventh Street and the beautification of Riverside Park. The reaching of an agreement closes forty years of negotiation between the New York Central and the city over this project.

From Thirtieth street to Sixtieth street the tracks are to be depressed and from the latter point on through Riverside Park they will be roofed over for the construction of the city's new elevated express highway. Work will be started first on the stretch of tracks south of Thirtieth street. The New York Central will contribute \$110,000,000, the city \$50,000,000 and the state of New York \$15,000,000 toward the cost of the improvement.

Specifications and estimates of cost totaling \$248,400, exclusive of land and damages, have been made for the elimination of a grade crossing of this company's tracks at Harlem avenue, in Cheektowaga, Erie County, N. Y.

The New York, Chicago & St. Louis has let a contract to the Roberts & Schaefer Company, Chicago, for the construction of a direct engine coaling plant at Lorain, Ohio.

The New York, Westchester & Boston has awarded a contract to United Engineers & Constructors, Inc., Philadelphia, Pa., for the extension of its main line from Rye to Port Chester, N. Y., about two miles, at a cost of approximately \$1,000,000.

The Northern Pacific plans to apply to the Interstate Commerce Commission for permission to construct a branch line in eastern Montana from

a point near Woodrow, north 24 miles in the direction of Bloomfield, at an estimated cost of about \$750,000.

The Pennsylvania plans the construction of a new passenger station at Gary, Ind., at a cost of about \$75,000.

The Pennsylvania's plans for improvements at Baltimore, Md., estimated to involve an expenditure by the company of about \$22,000,000, have been approved by the city council, which has passed the necessary ordinances to permit the work.

This company has awarded contracts for construction work as follows: To W. F. Trimble & Sons Company, Pittsburgh, Pa., for the completion of inbound and outbound freight houses and platforms above foundations at Eleventh and Etna streets, Pittsburgh, \$700,000; to Stevens Construction Company, Cleveland, Ohio, for the construction of a retaining wall along the east bank of the Mahoning River at Girard, Ohio, \$90,000, and to Ferguson & Edmondson, Pittsburgh, Pa., for drainage improvements at Fairplay, Ohio, and Uhrichsville, \$71,000.

The Pittsburgh & West Virginia has received the approval of the War Department on its plans for its new \$1,000,000 bridge over the Monongahela River at Belle Vernon, Pa., which will carry the tracks of its new extension from Cochran Mills to Connellsville, Pa. A contract for the substructure of the bridge has been let to the Vang Construction Company, Pittsburgh, and for the super-structure to the American Bridge Company.

The Southern has let a contract to the Bates & Rogers Construction Company, Chicago, for the construction of second main track between Rogers Gap, Ky., and Lexington, 19.6 miles.

The Southern Pacific has authorized the construction of a combination passenger station and office building at Stockton, Cal., which will involve the expenditure of \$300,000.

This company contemplates the expenditure of about \$750,000 for improvements at Eugene, Ore., and Springfield. These will include the construction of second main track from Eugene to Springfield Junction at a cost of about \$350,000, and the construction of an addition to the passenger yard at Eugene, enlargement of the freight station and the construction of new stock pens and additional trackage in the yards.

The Spokane, Portland & Seattle has announced plans for the construction of about 69 miles of new line in Linn County, Ore., to serve a timber area which is estimated to contain 30,000,000,000 board feet. The cost of the project will be about \$3,000,000, including the construction of 41 miles of main line and 28 miles of branch line.

The Toronto, Hamilton & Buffalo has awarded a contract to the Roberts & Schaefer Company, Chicago, for the construction of a 300-ton capacity three-track coaling station and sanding plant and a three-track electric cinder handling plant at Hamilton, Ont.

## Supply Trade News

**The Johns-Manville Corporation**, New York, has moved its Milwaukee sales office to the Railway Exchange building, 97 East Wisconsin avenue.

**The Alemite Manufacturing Corporation**, Chicago, has changed its name to the Alemite Corporation.

**The Texas Creosoting Company**, Orange, Tex., has purchased the plant of the Houston Wood Preserving Company at Houston, Tex.

**The Marion Steam Shovel Company**, Marion, Ohio, has appointed the Gesner Contractors' Equipment Company its sales representative at New Haven, Conn., and Philadelphia, Pa.

**The Austin Company**, Cleveland, Ohio, has organized the Austin Company of Texas to handle engineering projects in the Southwest, including Texas, Western Louisiana, Southern Arkansas, Oklahoma and New Mexico.

**The American Hoist & Derrick Company**, St. Paul, Minn., has opened a branch office and warehouse at 337 South Anderson Street, Los Angeles, Cal., in charge of **W. H. Lummus**, who has represented that company on the Pacific coast for many years. The office at San Francisco, Cal., has been moved from that city to 5515 Doyle Avenue, Oakland, Cal. **Boyd Nixon**, who was in charge of the San Francisco office, is in charge of the Oakland office.

**The Copperweld Steel Company**, Glassport, Pa., has placed **George F. Bain**, with headquarters at 30 Church Street, New York, in charge of its Northeastern district, which it has established to include all of the New England states and the state of New York north of Westchester and Rockland counties. **Paul Van Wagner** is now district manager for Greater New York and for New Jersey, Pennsylvania and West Virginia, with headquarters at 30 Church Street, New York.

### Personal

**W. G. Hume**, formerly general sales manager of the Keystone Steel & Wire Company, Peoria, has been elected vice-president of the Northwestern Barb Wire Company, Sterling, Ill.

**W. M. Cusack**, formerly with the McMyler-Interstate Company, Cleveland, Ohio, has joined the sales force of the American Hoist & Derrick Company, St. Paul, Minn.

**Thomas D. Crowley**, with headquarters at Chicago, has been appointed western sales representative of the Electric Railweld Sales Corporation, Chicago.

**J. A. Amos** has been elected vice-president in charge of sales and service of the Pyle-National Company, Chicago, and **George E. Haas** has been appointed assistant to Mr. Amos.

**Clarence E. Irwin**, with headquarters at 310 Frisco building, St. Louis, Mo., has been appointed St. Louis represen-

tative of the railway appliance division of the American Fork and Hoe Company, Cleveland, Ohio.

**J. E. Buckingham**, district manager of the railroad department of the Worthington Pump & Machinery Company at St. Louis, Mo., has been appointed acting manager of that department, with headquarters at Harrison N. J., to succeed **D. R. Coleman**, who has been granted a six-months' leave of absence.

**H. B. Miller**, manager of the Pittsburgh (Pa.) branch office of the Truscon Steel Company, Youngstown, Ohio, has been elected vice-president and general manager of the Pacific Coast plant. **W. H. Kelly**, of the Chicago office, has been appointed manager of the Pittsburgh office to succeed Mr. Miller.

**Grant W. Spear**, vice-president and eastern sales manager of the Dearborn Chemical Company, Chicago, whose retirement from active service was noted in the July issue, was born at Aurora, Ill., and graduated from the University



Grant W. Spear

of Illinois in 1887. He was engaged in the wood-working business until 1897, when he entered the sales department of the Dearborn Chemical Company, of which, for the last 20 years, he had been vice-president and eastern sales manager.

**McLeod Thomson**, for many years district sales agent of the Rail Joint Company, New York, with headquarters at Philadelphia, Pa., has resigned, and **Milton Markley**, who has been associated with Mr. Thomson for a number of years, will continue to represent the Rail Joint Company in the Philadelphia territory.

**Page Harris**, vice-president of the National Lumber & Creosoting Company, Texarkana, Ark., notice of whose death was published in the July issue, was born in May, 1868, at Lawrence, Kan., and was educated at the University of Kansas. He entered railway service after leaving college and in 1904 became a superintendent on the Texas & Pacific, later being promoted to as-

sistant general superintendent. Mr. Harris left railway service in 1912 to become vice-president of the National Lumber & Creosoting Company, which position he was holding at the time of his death.

**Albert E. Ferguson**, who has been in charge of the St. Louis (Mo.) sales office of the National Lumber & Creosoting Company, has been appointed general sales manager of that company with headquarters both at Texarkana, Tex.-Ark., and at St. Louis.

## Trade Publications

**Spiral Chutes and Side-Cut Gates.**—The Roberts & Schaefer Company, Chicago, has issued Bulletin No. 120, of eight pages, describing and illustrating its spiral chutes and side-cut, non-skim gates for locomotive coaling plants for the purpose of preventing the breakage and segregation of engine fuel.

**Chain for Cranes, Dredges and Heavy Duty.**—A six-page pamphlet bearing this title has been issued by the American Chain Company, Bridgeport, Conn., in which are given tables showing the number of links per foot, weights, proof tests and safe working loads for the various sizes, together with other information of value.

**High Test Welding Rod.**—The Oxweld Acetylene Company, New York, has issued a 12-page booklet describing the development of its high-test steel welding rod and the results obtained by its use where welds of uniform high strength are essential. The booklet contains instructions as to the use of this rod in order to obtain the best results.

**Servicized Products.**—In a bulletin of 28 pages by the Servicized Products Corporation, Chicago, detailed information is given concerning the various bitumen products manufactured by this company. These include water proofing materials, asphalt planking, grade crossing pavements, roofing, etc. The nature of the material is outlined in the text and numerous photographs illustrate the various applications.

**Looking Ahead Twenty Years.**—A 38-page booklet issued by the Grasselli Chemical Company, Inc., Cleveland, Ohio, contains a treatise on wood preservation with particular reference to the use of zinc chloride. The booklet is copiously illustrated with views of installations of timber and lumber treated with zinc chloride in various kinds of structures and a complete index is given for both the text and the illustrations.

**Metalayer.**—The Metal Coatings Company of America, Philadelphia, Pa., has issued a four-page circular describing and illustrating the process whereby molten metal is sprayed on either metallic or non-metallic objects as a protection against corrosion or for other purposes. Among the illustrations is one showing members of the Delaware River bridge, between Philadelphia, Pa., and Camden, N. J.,

which were coated with zinc by this process.

**Concrete Hardener.**—The Master Builders Company, Cleveland, Ohio, has issued an attractive catalogue of 27 pages, entitled "The Fifth Ingredient," which includes a well-illustrated and charted discussion of the factors which cause deterioration in concrete floors, and of the methods which have been developed to overcome these factors. A large number of graphs and photographs are used to show the results which have been secured through the use of the new fifth ingredient, which is known as "Omicron."

**Celite for Concrete.**—A 24-page pamphlet has been issued by the Johns-Manville Corporation, New York City, which describes and illustrates the advantages and uses of Celite in concrete. Some of the more important subject headings in this pamphlet include: Desirable Features in Concrete; Celite and How It Is Used; How Celite Improves Workability; The Effect of Celite on Strength and Uniformity; and How Celite Insures Maximum Water-Tightness.

**Fire Protection.**—The Chicago Bridge & Iron works, Chicago, has issued a 24-page booklet dealing with fire protection at shop buildings, industrial plants and other structures, and describing the various methods used in providing a private system. The booklet is illustrated with news of actual installations and contains tables giving the sizes and capacities of Horton tanks as well as hydraulic tables for calculating water pressures, friction losses, pipe sizes for fire streams and other essential elements.

**Safe Lock Switch Machine.**—The Louisville Frog, Switch & Signal Company, Louisville, Ky., has issued an eight-page bulletin, No. 7A, which describes and illustrates the Model A Safe Lock Switch Machine, by means of which it is possible to operate quickly and safely single switches, crossover switches, single or double slip switches and single switches and derails, together with facing-point locks in connection with any of these arrangements. When applied to a crossover, one operation of the lever unlocks, throws and relocks both switches at the same time, insuring safe and expeditious handling of the work.

**New Cement Plant.**—In a four-page folder issued by the Ashgrove Lime & Portland Cement Company, Omaha, Neb., announcement is made of the completion of an entirely new plant of that company at Louisville, Neb. This announcement calls attention to the convenience of the location, the larger capacity afforded and the use in this plant of the latest type of cement making equipment. Attention is directed also to the fact that this company, in addition to manufacturing standard cement under the name of Ashgrove Cement, also manufactures a high-early-strength Portland cement marketed under the name of Quikard Cement.

## Personal Mention

**Gilbert J. Johnson**, supervisor of track on the Chesapeake & Ohio at Louisa, Ky., has been promoted to assistant trainmaster, with headquarters at Jenkins, Ky.

**O. M. Dawson**, roadmaster on the Norfolk & Western, with headquarters at Buena Vista, Va., has been promoted to assistant superintendent of the Shenandoah division, with headquarters at Roanoke, Va.

**A. T. Mercier**, president and general manager of the San Diego & Arizona, with headquarters at San Diego, Cal., and an engineer by training and experience, has been elected vice-president and general manager of the Pacific Electric, with headquarters at Los Angeles, Cal. Mr. Mercier was born on December 11, 1881, at New Orleans, La., and was educated at Tulane University, entering railway service in 1903 as a transitman and roadmaster's clerk at Los Angeles. From 1906 to March, 1908, he served as an engineer in charge of construction at various points and was promoted to assistant engineer of the Los Angeles division at

June 1, 1913, as a section laborer on the Great Northern, working during the summer months until graduating from high school in June, 1916, when he became a clerk in a superintendent's office on the same road. He entered the aviation branch of the United States Army on February 1, 1918, and on his return to civil life on February 1, 1919, was appointed assistant roadmaster on the Great Northern. On December 14, 1920, he was appointed roadmaster on the Soo Line at Crosby, Minn., where he remained until December 20, 1924, when he was promoted to special representative in the president's office at Minneapolis, Minn. Mr. Branley became a trainmaster at Superior, Wis., on May 1, 1926, and was serving in that capacity at Gladstone, Mich., at the time of his recent promotion to superintendent.

**George H. Burgess**, at one time chief engineer of the Delaware & Hudson, has been elected president of the Tennessee, Alabama & Georgia. Mr. Burgess was born on June 19, 1874, at Oshkosh, Wis., and was educated at the University of Wisconsin. He entered railway service in 1896 as a rodman on the Pennsylvania, and thereafter served successively as assistant bridge inspector, bridge inspector, and assistant engineer until 1901, when he became an assistant engineer on the Erie. He was promoted to engineer of terminal improvements in 1905 and in the following year was promoted to principal assistant engineer. Mr. Burgess was appointed chief engineer of the Delaware & Hudson in 1908, and in May of the following year was appointed chairman of the valuation committee. He served in that capacity until 1913, when he was appointed real estate agent. In July, 1925, Mr. Burgess left railway work to become associated with Coverdale & Colpitts, consulting engineers, with headquarters at New York, and was connected with the firm at the time of his recent election to the presidency of the Tennessee, Alabama & Georgia.



A. T. Mercier

the latter time. This was followed by his promotion to assistant district engineer at Los Angeles in November, 1912, and to division engineer at Bakersfield in November, 1912, later being transferred to Los Angeles. He entered the operating department in February, 1917, as assistant superintendent at Dunsmuir, Cal., and was promoted to superintendent of the Portland division in September, 1918. In 1921, he was appointed general manager of the San Diego & Arizona, and in 1927, was also made president of that company, which positions he was holding at the time of his election as vice-president and general manager of the Pacific Electric.

**J. R. Branley**, trainmaster on the Minneapolis, St. Paul & Sault Ste. Marie, whose early railway experience was in the maintenance of way department, has been promoted to superintendent at Bismarck, N. D. He was born on November 25, 1897, at Melrose, Minn., and entered railway service on

**J. J. Breheny**, superintendent of the Oklahoma-Southern division of the Chicago, Rock Island & Pacific with headquarters at Ft. Worth, Tex., whose early railway experience was gained in the maintenance of way department, has been promoted to acting general superintendent of the First district, with headquarters at Des Moines, Iowa. Mr. Breheny was born on July 3, 1882, at Atlantic, Iowa, and entered the service of the Rock Island as a section laborer in 1897. In 1902, he was promoted to roadmaster's clerk and in the following year was further promoted to chief clerk to the division engineer. In 1908, he was promoted to roadmaster on the Nebraska division and a few months later was made chief maintenance of way clerk on the Iowa division, later in the same year returning to the Nebraska division as roadmaster, where he remained until 1912,

when he entered the operating department as a trainmaster on the Colorado division. On April 2, 1924, Mr. Breheny was promoted to superintendent of the Oklahoma-Southern division, which position he was holding at the time of his recent promotion.

**W. C. Sloan**, assistant to the operating vice-president of the Northern Pacific, and an engineer by training and experience, has been promoted to general manager of the Lines East of



W. C. Sloan

Paradise (Mont.), with headquarters as heretofore, at St. Paul, Minn. Mr. Sloan was born on July 9, 1886, and was educated at Cornell University. He entered railway service in February, 1907, as an inspector on the New York terminals of the Pennsylvania, and during the following year was connected with the Brooklyn Rapid Transit. On April 1, 1909, he entered the service of the Northern Pacific in the engineering department, where he held various positions until 1915, when he entered the operating department as a trainmaster at Forsyth, Mont. In 1917, he was promoted to superintendent at Pasco, Wash., and shortly thereafter joined the United States Army, in which he served overseas as a captain until 1919. On his return to civil life, he resumed his duties as superintendent, serving successively on the Rocky Mountain, Pasco, Yellowstone and Lake Superior divisions until July, 1927, when he was promoted to assistant to the operating vice-president. He was holding the latter position at the time of his promotion to general manager of the Lines East of Paradise on July 15.

### Engineering

**Hans Schantl**, chief engineer of the Mississippi River & Bonne Terre and the Missouri-Illinois, with headquarters at Bonne Terre, Mo., has been appointed division engineer of the Missouri-Illinois, which has taken over the operation of the former road. Mr. Schantl's headquarters will remain at Bonne Terre. The Missouri Pacific controls the Missouri-Illinois and has extended the jurisdiction of its general officers over that road.

**W. H. Kirkbride**, engineer maintenance of way and structures of the Southern Pacific (Pacific Lines), with headquarters at San Francisco, has been placed in charge of the valuation department of those lines, reporting to the vice-president in charge of operation. **J. B. Baker** has been appointed valuation officer, with headquarters at the same point, in immediate charge of the work and personnel of the valuation department, reporting to the engineer maintenance of way and structures.

**W. G. Kemmerer**, master carpenter on the Eastern division of the Central region of the Pennsylvania, with headquarters at Alliance, Ohio, has been promoted to assistant engineer in the office of the chief engineer maintenance of way of the Western region at Chicago. **E. R. Parke**, supervisor on the Philadelphia division at Middletown, Pa., has been promoted to division engineer on special duty in the office of the general superintendent of motor service, to succeed **N. M. Lawrence**, who has been transferred to the Elmira division at Elmira, N. Y., where he will succeed **J. F. Swenson**, who has been transferred to the Middle division at Altoona, Pa.

**George S. Fanning**, whose promotion to chief engineer of the Erie was noted in the July issue, was born on April 25, 1885, at Detroit, Mich., and was educated at the University of Michigan, from which he graduated in 1906. He entered railway service in 1906 as a rodman on the Michigan Central, and in 1907 became an instrumentman with the Detroit River Tunnel Company, a subsidiary of the Michigan Central. During that same year he was promoted to assistant engineer and held



George S. Fanning

this position until 1910, when he became a resident engineer on the Algoma Central & Hudson Bay. In 1913, he became a resident engineer on the Erie at Meadville, Pa., his first connection with that road. In January, 1914, he was appointed estimating engineer at New York and in May, 1916, was promoted to chief draftsman. On June 1, 1918, he was promoted to assistant to the chief engineer, and on

March 1, 1920, was made office engineer. On May 1, 1925, he was promoted to principal assistant engineer, which position he held until February 15, 1927, when he was promoted further to assistant chief engineer, the position which he was holding at the time of his recent promotion to chief engineer, which became effective on June 16.

**T. W. Pinard**, whose promotion to engineer of bridges and buildings of the New York zone of the Pennsyl-



T. W. Pinard

vania, with headquarters at New York was noted in the July issue, was born on December 16, 1877, at Camden, N. J., and attended Drexel Institute at Philadelphia, Pa., for four years, specializing in structural engineering, architectural design and building construction. After service with several firms engaged in design and construction, including the American Bridge Company, he became a draftsman in the maintenance of way department of the Pennsylvania at Philadelphia in 1912, and later was promoted to bridge inspector in charge of structural design. In 1920, he was promoted to assistant engineer on the Eastern Ohio division and later in the same year was promoted to assistant engineer maintenance of way of the Northwestern region at Chicago, retaining that position on the Western region which was formed by the consolidation of the Northwestern and the Southwestern regions.

**Richard Brooke**, engineer maintenance of way of the Chesapeake & Ohio, with headquarters at Richmond, Va., has been promoted to engineering assistant to the president, with headquarters at Cleveland, Ohio. **L. J. Drumeller**, assistant division engineer at Russell, Ky., has been promoted to division engineer of the Hinton division with headquarters at Hinton, W. Va., to succeed **H. L. McCutcheon**, notice of whose death will be found elsewhere in these columns. **J. W. Knapp, Jr.**, supervisor at Richmond, Va., has been appointed assistant division engineer at Russell to succeed Mr. Drumeller.

A sketch of Mr. Brooke's railway career, together with his portrait, was

published in the May issue, at the time of his promotion to engineer maintenance of way.

**J. W. Smith**, whose promotion to principal assistant engineer of the Erie was noted in the July issue, was born on August 8, 1879, at Hazleton, Pa., and was graduated from Lafayette College in 1904. He entered railway service with the Erie in June of that year as a transitman on preliminary surveys, and in September, 1905, he was promoted to an inspector on construction work. In February, 1907, he was promoted to resident engineer on terminal improvements and double track and grade reduction and in February, 1912, he was promoted to assistant engineer on double track and grade reduction. In January, 1914, he was promoted to district engineer on terminal improvements with headquarters at New York City, and in February, 1917, he was further promoted to assistant valuation engineer. In June, 1925, he was promoted to general office engineer, which position he was holding at the time of his recent promotion to principal assistant engineer.

**W. K. Tate**, whose promotion to industrial engineer of the Nashville, Chattanooga & St. Louis was noted in the July issue, was born on January 13, 1898, at Tyler, Tex., and was educated at Vanderbilt University. Mr. Tate entered railway service on February 13, 1917, as a draftsman in the chief engineer's office of the N. C. & St. L., and a few days later was transferred to a locating party, with which he served successively as draftsman, instrumentman and topographer. On January 1, 1918, he was promoted to assistant engineer on the Huntsville division, with headquarters at Tullahoma, Tenn. During 1918, he served for two months in the United States Army, after which he resumed his position as assistant engineer. On May 3, 1927, he assumed the duties as supervisor of the McMinnville branch, in addition to his other duties, and was holding these positions at the time of his recent promotion to industrial engineer.

**O. V. Derr**, whose promotion to general office engineer of the Erie, with headquarters at New York, was noted in the July issue, was born on April 27, 1885, at Needham, Mass., and was graduated from Stevens Institute of Technology in 1904. He entered railroad service on July 4, 1904, with the Baltimore & Ohio in the survey and construction departments and in September, 1906, he was promoted to assistant engineer in the maintenance of way department. In July, 1908, he became an assistant engineer in the maintenance of way department of the Lehigh Valley, but in April, 1910, he returned to the B. & O., where he served as chief of party in the construction department. In February, 1911, he became field engineer for Eyre-Shoemaker, Inc., railroad contractors at Philadelphia, Pa., and in August of the same year he became an inspector in the construction department of the

Boston & Albany. In February, 1912, he became a resident engineer in the construction department of the Erie, and from March, 1918, to August, 1919, he served in France as a captain of engineers in the United States Army. In September, 1919, he resumed his duties as resident engineer on the Erie, which position he was holding at the time of his recent promotion to general office engineer.

## Track

**M. Swanson**, extra gang foreman on the Algoma Central & Hudson Bay, has been promoted to roadmaster, with headquarters at Franz, Ont., to succeed **W. F. McDermott**, deceased.

**George W. Colwell**, roadmaster of the Southern division of the Alaska Railroad at Tunnel, Alaska, has been promoted to general roadmaster, with headquarters at Anchorage, Alaska, to succeed **H. Horne**, who has resigned.

**William Johnston**, roadmaster on the Beardstown division of the Chicago, Burlington & Quincy, with headquarters at Centralia, Ill., has been transferred to the Galesburg division at Galesburg, Ill., to succeed **C. L. Griggs, Jr.**, who has been transferred to Centralia to take the place of Mr. Johnston.

**R. E. Vermillion** has been appointed roadmaster of all districts of the Missouri-Illinois in Illinois, together with the Mosher and Ste. Genevieve terminals in Missouri, and **C. H. Flint** has been appointed roadmaster of all other districts in Missouri, including the former Mississippi River & Bonne Terre, the operation of which has been taken over by the Missouri-Illinois.

**C. J. Tisdell**, section foreman on the Missouri-Kansas-Texas at Woodbine, Tex., has been promoted to roadmaster at Denison, Tex., to succeed **E. T. Lytle**, who has been transferred to Hillsboro, Tex., to take the place of **B. F. Harrison**, who, in turn, has been transferred to Mokane, Mo., to succeed **H. S. Brown**, who has been assigned to other duties.

**Thurman H. Bilbrey**, whose promotion to roadmaster on the Chicago, Rock Island & Pacific was noted in the July issue, was born on March 25, 1878, at Hollow Rock, Tenn., and entered railway service in July, 1906, as a section laborer on the Nashville, Chattanooga & St. Louis. On April 25, 1898, he was transferred to a bridge and building gang, and on April 21, 1900, he became a bridge carpenter on the Choctaw, Oklahoma & Gulf (now a part of the Rock Island). In June, 1906, he was promoted to bridge and building foreman on the Rock Island and was holding that position at the time of his recent promotion to roadmaster.

**Vernon Proper**, section foreman on the Adirondack division of the New York Central, has been appointed assistant supervisor of track on the Adirondack and Ottawa divisions, with headquarters at Moira, N. Y., succeeding

**E. F. Anderson**, who has been transferred to the Syracuse division at Syracuse, N. Y. Mr. Anderson succeeds **M. H. LaRouche**, who has been promoted to supervisor on the Adirondack and Ottawa divisions, with headquarters at Moira, succeeding **Michel Keefe**, who was retired on June 30. **John Johnson**, for many years supervisor on the River division, at Newburgh, N. Y., was retired on July 31, having reached the age limit.

**William M. Farrel**, roadmaster on the Oregon Short Line at Nampa, Idaho, has been promoted to general roadmaster of the Idaho division, with headquarters at Pocatello, Idaho, and **Frank Rader**, assistant roadmaster at Ontario, Ore., has been promoted to roadmaster at Nampa to succeed Mr. Farrel. **Wyatt L. Spitler**, section foreman at Glenns Ferry, Idaho, has been promoted to roadmaster at Cache Junction, Utah, to succeed **William Anderson**, who has been transferred to Montpelier, Idaho, succeeding **Leo Irving**, who, in turn, has been transferred to Pocatello to succeed **Frank Ivers, Jr.**, whose promotion to general roadmaster of the Utah division was noted in the July issue. **Arthur L. Young**, section foreman at West Yellowstone, Mont., has been promoted to assistant roadmaster on the Salt Lake division. **D. Rushford**, roadmaster at Pocatello, has been transferred to Salt Lake City to succeed **Elmer Holt**, who has retired on a pension.

**F. D. Pitts**, assistant on engineer corps of the Pennsylvania at Huntingdon, Pa., has been promoted to assistant supervisor at Hollidaysburg, Pa., succeeding **J. T. Honker**, who has been transferred to Huntingdon, where he will succeed **J. J. Clutz**, who has been promoted to supervisor with headquarters at Clayton, Del. **J. J. Hitz**, assistant supervisor at Pottsville, Pa., has been transferred to Harrington, Del., where he will succeed **G. M. Hain**, who has been transferred to Lancaster, Pa., to succeed **H. D. Kruggel**, who, in turn, has been transferred to West Philadelphia, Pa. Mr. Kruggel will succeed **A. H. Whisler**, who has been promoted to supervisor with headquarters at Wilkes-Barre, Pa., to succeed **B. W. Tyler, Jr.**, who has been transferred to Chambersburg, Pa. **Carl McGhee**, assistant supervisor on the Eastern division at Wooster, Ohio, has been promoted to supervisor on the Buffalo division at Struthers, Pa., succeeding **I. E. Long**, who has been granted a leave of absence. **I. S. Brumagin**, assistant supervisor on the Pittsburgh division, has been transferred to Wooster to succeed Mr. McGhee.

## Bridge and Building

**Correction.**—In noting the promotion of **H. M. Church** to the position of general supervisor of bridges and buildings of the Chesapeake & Ohio in the July issue, his title was inadvertently given as general inspector of bridges and buildings.

**Lloyd Castagneto**, bridge and building inspector on the Idaho division of the Oregon Short Line, has been promoted to assistant supervisor of bridges and buildings on the same division.

**J. Mendenhall**, supervisor of bridges and buildings on the Oregon-Washington Railroad & Navigation Company at Walla Walla, Wash., has been transferred to Spokane, Wash.

**M. J. McCoskey** has been appointed supervisor of bridges and buildings on the Lehigh Valley, with headquarters at Buffalo, N. Y., to succeed **J. W. Holcomb**, who has retired.

**Walter Watson**, clerk in the office of the superintendent of bridges and buildings of the Elgin, Joliet & Eastern at Joliet, Ill., has been promoted to superintendent of bridges and buildings, with the same headquarters, to succeed **W. B. Hotson**, notice of whose death will be found elsewhere in this issue. Mr. Watson was born on March 25, 1876, at Carlinhowe, Yorkshire, England, and entered railway service on September 27, 1894, in the maintenance of way department of the E. J. & E. He served in various capacities as carpenter, painter and signal foreman until 1909, when he became clerk to the superintendent of bridges and buildings, which position he was holding at the time of his promotion to superintendent of bridges and buildings.

### Purchasing and Stores

**George C. Smith**, purchasing agent of the Union Pacific Railroad, at Omaha, Neb., retired from active service on July 1 at the age of 70 years, after 43 years' service with that road. The position of purchasing agent of that unit of the system has been abolished and the duties pertaining to the former office have been taken over by the general purchasing agent of the system. **Harold Wilson** chief clerk to the assistant to the president has been promoted to assistant to the general purchasing agent, with headquarters at Omaha.

### Obituary

**W. H. Cox**, supervisor on the Illinois Central at Fulton, Ky., died in that city on May 12 after several months' illness.

**W. F. McDermott**, roadmaster on the Algoma Central & Hudson Bay, with headquarters at Franz, Ont., died on May 24.

**Ralph E. Miller**, bridge engineer of the St. Louis-San Francisco, with headquarters at St. Louis, Mo., died on July 23 at the Frisco Employers Hospital in that city, at the age of 51 years.

**John Farquhar**, who retired in 1928 as superintendent of bridges and buildings of the Quebec Central, with headquarters at Sherbrooke, Que., died on June 9 in that city, at the age of 84 years.

**H. L. McCutcheon**, whose promotion to division engineer on the Chesapeake & Ohio, with headquarters at Hinton,

W. Va., was noted in the July issue, was killed on June 25 near Hinton when the motor car on which he was riding was struck by a train.

**George K. McCormick**, assistant engineer on the Louisville & Nashville, with headquarters at Middlesboro, Ky., died on July 18 in a hospital in that city, after an illness of several months. Mr. McCormick had been in the service of the L. & N. for 40 years.

**William L. Breckinridge**, formerly chief engineer of the Chicago, Burlington & Quincy lines east of the Missouri River, who retired in 1923, died on July 11, at his home in Chicago, after an extended illness. Mr. Breckinridge was born on June 29, 1857, at Louisville, Ky., and graduated from Washington University, St. Louis, Mo., in 1879. Immediately following his graduation, he entered railway service as a rodman on the Burlington and by suc-



William L. Breckinridge

cessive promotions became engineer of the Iowa lines. In 1899, he was promoted to chief engineer of the lines east of the Missouri River, which position he held until 1918, when he was appointed chief engineer of the system for the United States Railroad Administration. At the end of federal control in 1920, he was appointed assistant chief engineer of the system and was holding that position at the time of his retirement on account of ill-health in 1923.

**Captain John Feild**, retired assistant engineer on the Norfolk & Western, died on June 11. He was born on November 15, 1857, at Petersburg, Va., and entered the service of the Norfolk & Western on August 1, 1881, as a chainman on the Radford division. On January 1, 1882, he was made locating engineer on the Sciota division. On October 1, 1896, he was appointed resident engineer and on January 1, 1897, was transferred to the Radford division. Mr. Feild was appointed engineer in charge on the Pocahontas division in 1900 and on April 1, 1905, he was promoted to division engineer. He was made engineer in charge on the Norfolk division in 1908 and was promoted to valuation engineer, with headquarters at Roanoke, Va., in June, 1913.

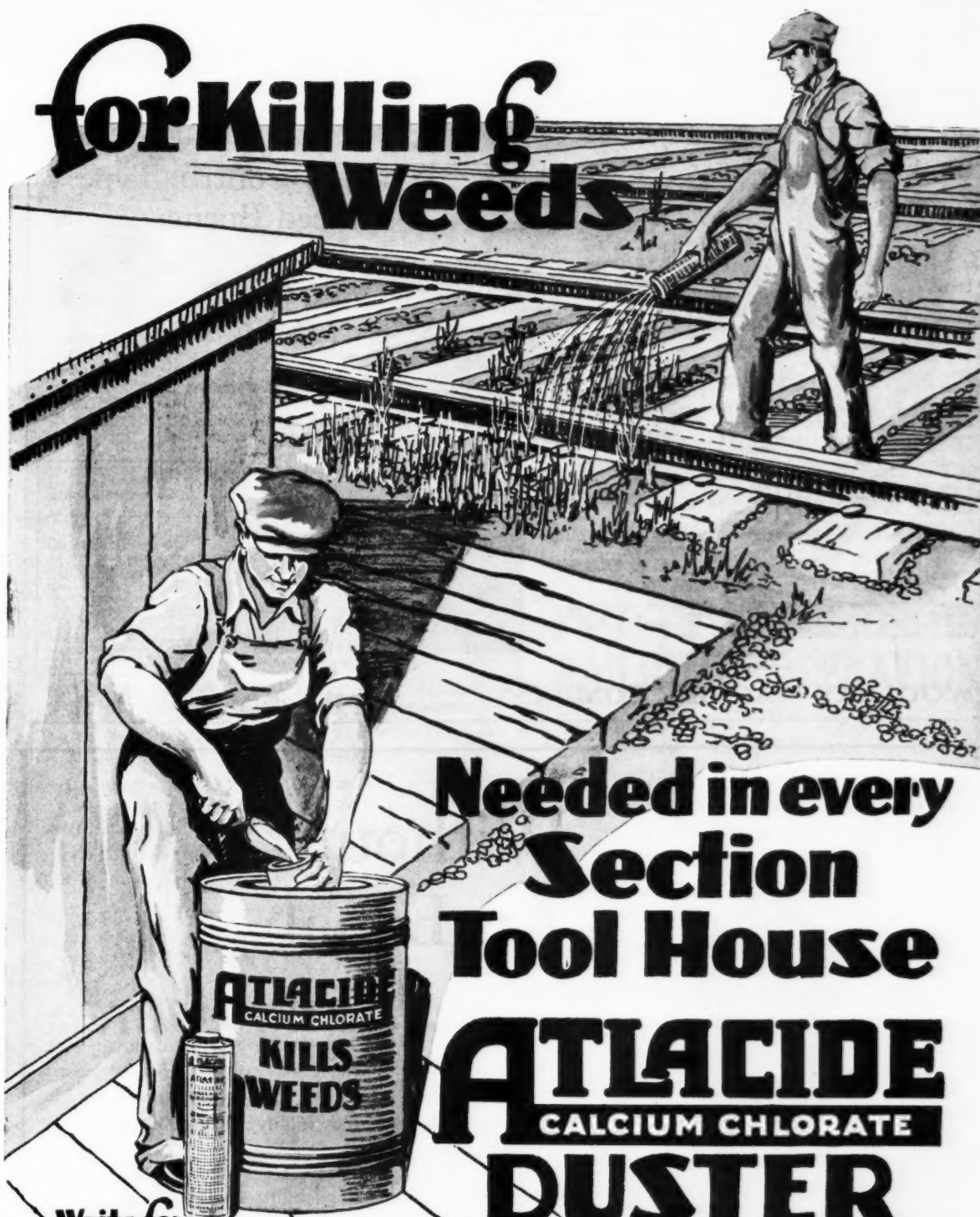
He was appointed assistant engineer on September 1, 1918, which position he was holding at the time of his retirement on December 1, 1927.

**W. B. Hotson**, superintendent of bridges and buildings of the Elgin, Joliet & Eastern, with headquarters at Joliet, Ill., died at his home in that city on June 25, following a heart attack. Mr. Hotson was born on December 1, 1881, at Meadville, Pa., and was educated at Allegheny College. After leaving college in 1904, he was employed in the engineering department of the Pittsburgh & Lake Erie at McKeesport, Pa., for about a year, following which he was in the engineering department of the Pennsylvania at Louisville, Ky., for about two years. He then was with the engineering department of the Cleveland, Cincinnati, Chicago & St. Louis for a short time, becoming a draftsman on the E. J. & E. at Joliet in the latter part of 1907. He later was promoted to assistant engineer in charge of the drafting room and in 1916 was further promoted to superintendent of bridges and buildings, which position he was holding at the time of his death.

**Robert R. Hammond**, formerly engineer maintenance of way of the St. Louis-San Francisco and later vice-president of that road and of the Chicago & Eastern Illinois, died on June 27 at his home at Barrington, Ill. He was born on February 14, 1857, at Ottumwa, Iowa, and was educated at Baker University in Kansas and Iowa Wesleyan University. Entering railway service in 1876 as an agent and operator on the Chicago, Burlington & Quincy, he became an operator on the Kansas City, Ft. Scott & Memphis (now a part of the Frisco) in 1881. By successive promotions he became superintendent at Springfield, Mo., and in 1898 he was promoted to general superintendent of the Kansas City, Memphis & Birmingham (also a part of the Frisco system). In 1901, he was appointed engineer maintenance of way of the Frisco and in the following year was appointed assistant general manager of the Missouri-Kansas-Texas. In 1903, Mr. Hammond was appointed general manager of the Chicago & Eastern Illinois at Chicago, and after serving as second vice-president of the Frisco for a short time in 1904, he became second vice-president and general manager of the C. & E. I. Mr. Hammond left railway service on March 1, 1905, to become president of the Dering Coal Company at Chicago and later was president of the Hammond Cattle Company.

**Actual construction work** on the Reading's \$20,000,000 electrification project was begun on July 23 when the pouring of concrete foundations for the catenary supports was commenced at Wayne Junction on the Bethlehem branch. The work will proceed in both directions from this point and it is expected that this branch will be electrified as far as Lansdale by early fall of next year.

# for Killing Weeds



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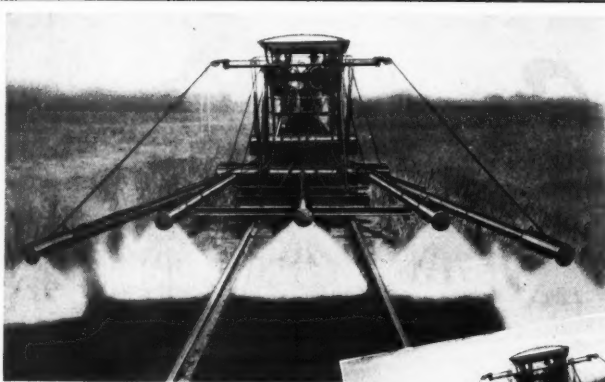
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**BOUND BROOK, N. J.**

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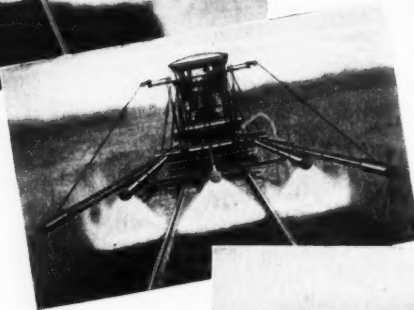
A Solid Wall of Flame 25 Feet Wide

THE "OCTOPUS" has been designed to meet every requirement as it actually exists for the complete and economical destruction of weeds on the right-of-ways of all railroads. Burners may be swung in or out—up or down—at the will of operator while the machine is in operation. Flames may be directed down the side of embankments, up the edges of cuts, or swung around the edges of platforms, crossing fences, buildings, etc. No loss of fuel—no fire where not needed, as each burner is under separate and instantaneous control.

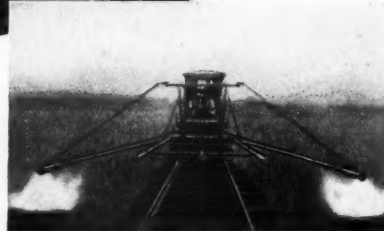
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*Widest Burning and Most Flexible Weed Burner Yet Produced.* Almost human in its action. Wherever the weeds are, the long arms reach out and get 'em.

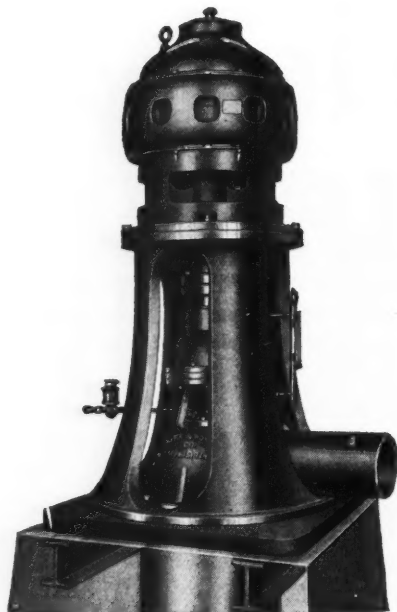
Unquestionably the Woolery "Octopus" is the most versatile, the most flexible, the most efficient and the most dependable weed burner ever produced, and its cost of operation is low—but a small fraction of the cost of other methods of weed destruction.

#### Attend a Demonstration or Arrange for one on Your Railroad

Railroad Officials and Others who have seen the "Octopus" in action are unanimously of the opinion that it is the final word to the railroad weed problem. Demonstrations are continually being made. Attend one if possible, or arrange for a special demonstration on your road.

**WOOLERY MACHINE COMPANY** [Inventors and Manufacturers] **MINNEAPOLIS, MINN.**

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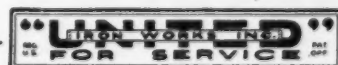
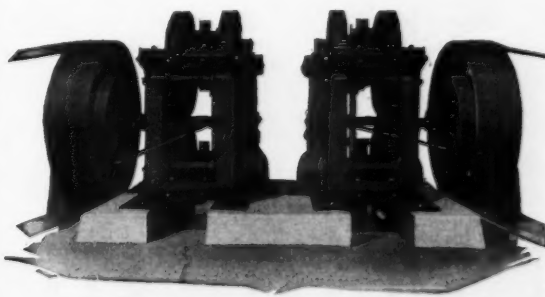
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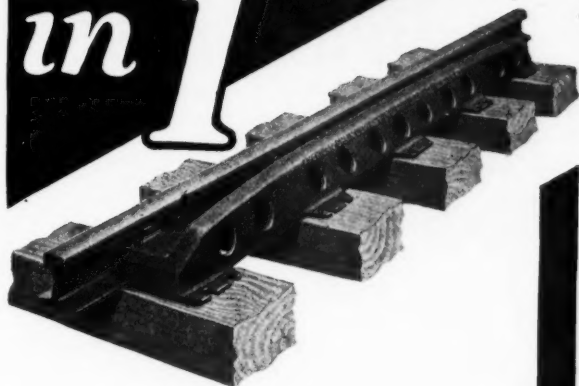
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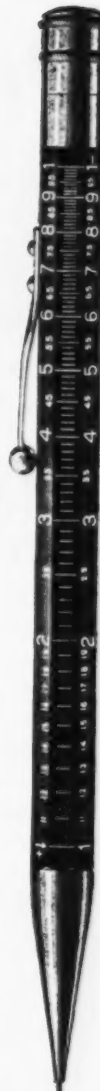
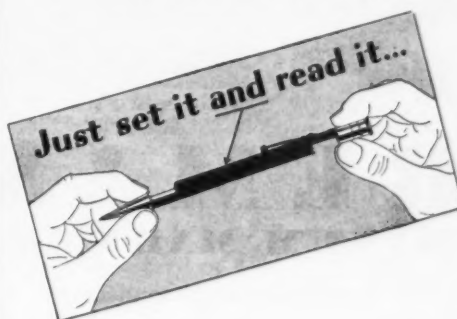
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for Every Railroad Purpose.

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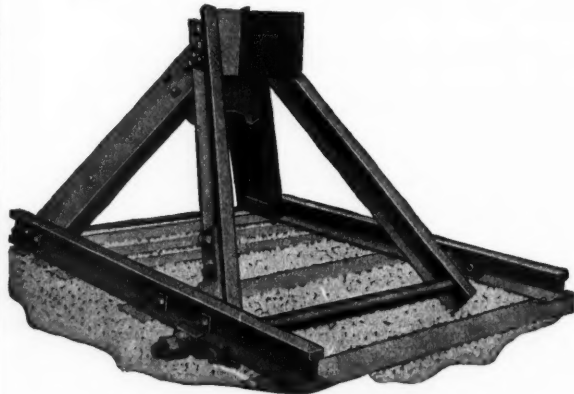
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By Charles H. Bartlett

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This is a manual which gives a method of easily checking and correcting curve alinement with tools always at hand.

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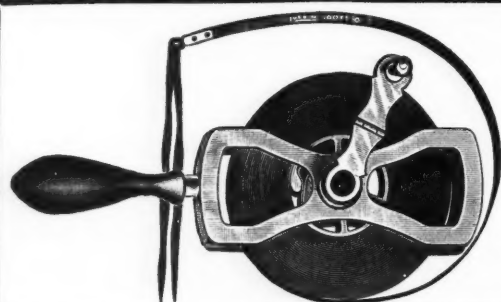
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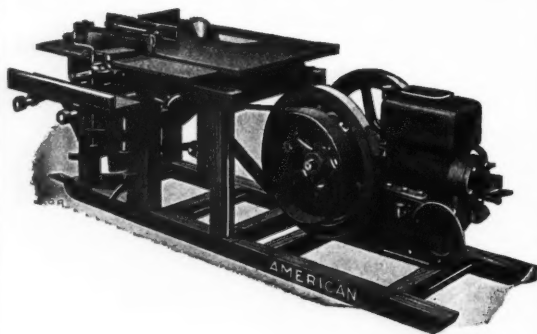
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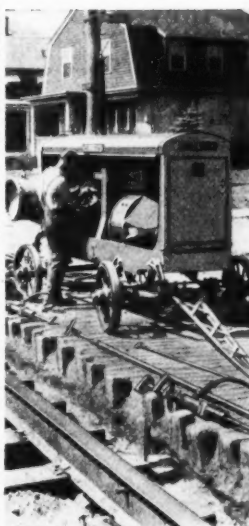
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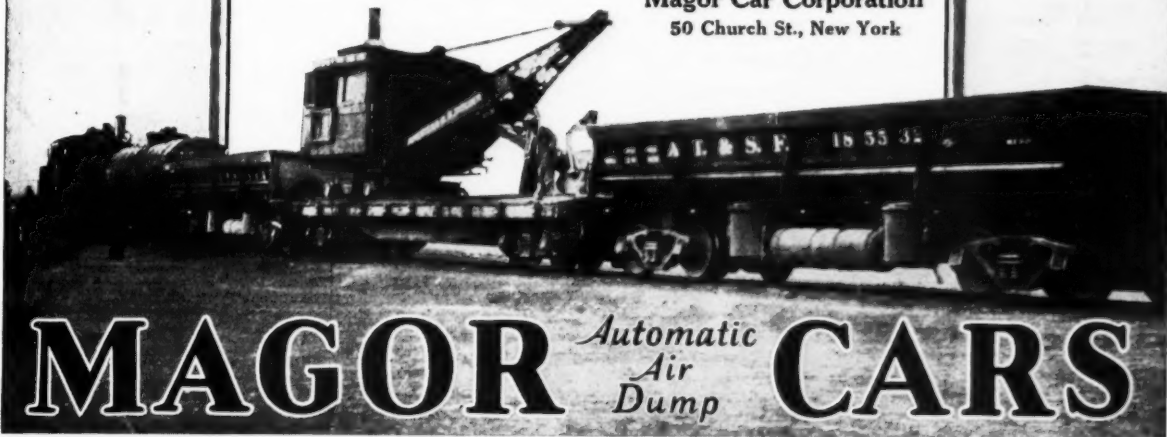
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| <b>Bearings, Tapered Roller, Thrust and Journal Box</b><br>Timken Roller Bearing Co.   | <b>Coal Handling Machinery</b><br>Industrial Brownhoist Corp.<br>Northwest Engineering Co.   | <b>Drainage Gates</b><br>Armco Culvert Mfrs. Assn.   | <b>Fence Posts</b><br>American Steel & Wire Co.   | <b>Ice Cutters</b><br>Jordan Co., O. F.  |
| <b>Benders, Rail</b><br>See Rail Benders   | <b>Coaling Stations</b><br>Fairbanks, Morse & Co.<br>Chicago Bridge & Iron Works   | <b>Drains, Perforated</b><br>Armco Culvert Mfrs. Assn.<br>Toncan Culvert Mfrs. Assn.   | <b>Fence Posts</b><br>American Steel & Wire Co.   | <b>Insecticides</b><br>Calcyanide Co.  |
| <b>Bolts</b><br>Bethlehem Steel Co.<br>Illinois Steel Co.  | <b>Compressors</b><br>Chicago Pneumatic Tool Co.<br>Ingersoll-Rand Co.<br>Sullivan Machinery Co.   | <b>Drills, Earth</b><br>Buda Co.   | <b>Fence Posts</b><br>American Steel & Wire Co.   | <b>Inspection Cars</b><br>See Cars, Inspection   |
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| <b>Braces, Track</b><br>Coover Railroad Track Brace Co.<br>Ramapo Ajax Corp.   | <b>Condensers</b><br>Chicago Pneumatic Tool Co.<br>Ingersoll-Rand Co.  | <b>Drill Steel, Rock</b><br>Chicago Pneumatic Tool Co.<br>Ingersoll-Rand Co.<br>Sullivan Machinery Co.   | <b>Frogs</b><br>Bethlehem Steel Co.<br>Buda Co.<br>Ramapo Ajax Corp.<br>Wharton Jr. & Co., Inc.<br>Wm.  | <b>Insulating Material</b><br>Barber Asphalt Co.   |
| <b>Bridge Floors</b><br>Armco Culvert Mfrs. Assn.  | <b>Concrete Roofing Tile</b><br>Federal Cement Tile Co.  | <b>Drills, Rock</b><br>Chicago Pneumatic Tool Co.<br>Ingersoll-Rand Co.<br>Sullivan Machinery Co.<br>Verona Tool Works   | <b>Fumigants</b><br>Calcyanide Co.  | <b>Jacks, Bridge</b><br>Buda Co.<br>Kalamazoo Railway Supply Co.   |
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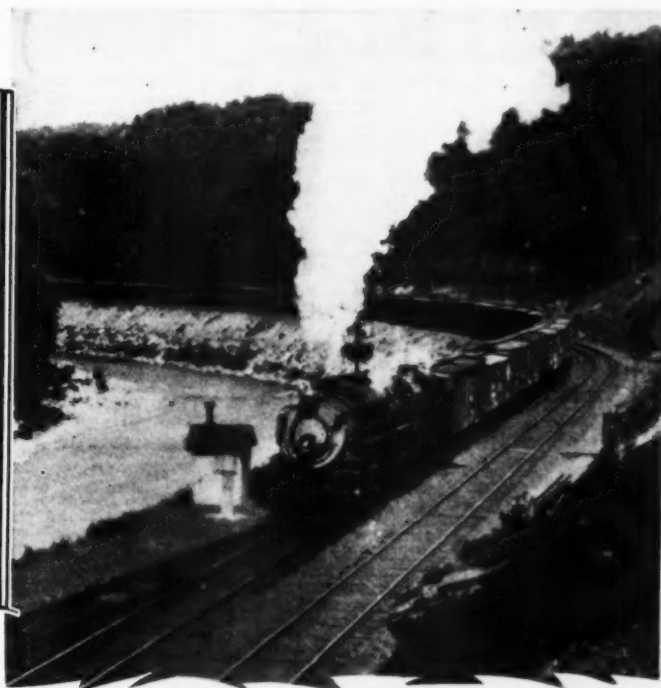
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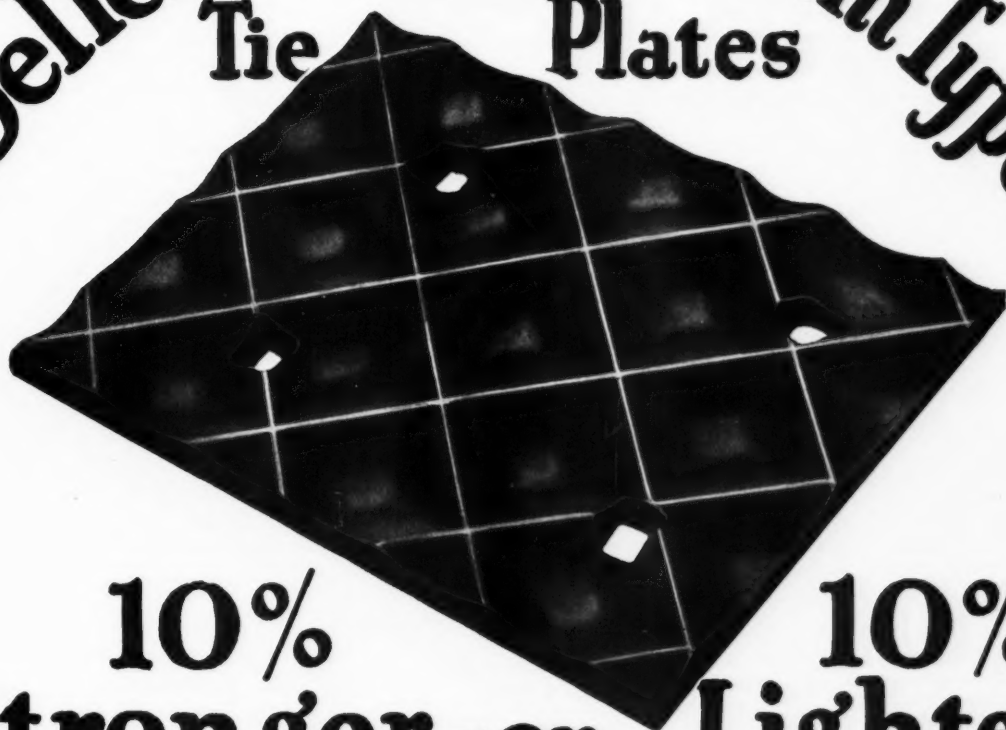
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